MAIN CURRENTS

IN MODERN THOUGHT

VOL. 7 No. 3

THE STILLWATER CONFERENCE

In a good society a common insight is required for successful pursuit of public policy, as it is for individual and private peace of mind. Whether the necessary knowledge of people and things be elementary or advanced, the important principle is that the point of view be shared.

In a stone-age society, such as still persists among aborigines in central Australia, the consensus is so primitive that it is usually acquired by the individual through simple upbringing. An examination of a complex society indicates that its culture and its law rest upon a more valid and more ample philosophy, and that at such a stage the root social problem becomes one of successfully communicating to the effective oncoming generation the more advanced knowledge possessed by that higher society.

Where the understanding of man, of nature, and their relations is unusually good, and the general dissemination thereof is provided for, we get an Athens. No doubt the Parthenon stands upon the Acropolis, but it was erected upon foundations laid by Pythagoras, Heracleitus and others. It is those spiritual splendors in their entirety, not his personal genius alone, which we see celebrated and concentrated in Plato.

When the true foundations in Attic insight began to crumble, the whole structure of that noble state was wrenched, and out of the crisis arose a differently proportioned outlook. Therefore we had in turn Rome's more articulate law and lowlier arts, derived from lesser concepts represented by Zeno and Epicurus, and memorialized in due time by Lucretius.

From dozens of indisputable examples of societies and their philosophies the most important of all social lessons emerges: If a good society is to live on, any new significant achievement in knowledge, especially of universals, demands a re-evaluation of working philosophy (as distinct from speculative thought), and this in turn implies progressive changes in education, to ensure the enlightenment required for wide-based adjustments in public policy.

To accommodate cultural evolution, nations which aspire to go on in freedom and democracy have flexible constitutions, whether they be written, as in the case of the United States, or unwritten, as in Britain. If our government is to persist, and to continue to derive its just powers from the consent of an educated electorate, it follows that new significant achievements in knowledge, particularly again of universals, *must* be conveyed to our citizens through education by adequate, freely developed, and systematic processes.

The practical program which is to have a firm beginning at the Stillwater Conference (dates and particulars in this issue) has a world-wide and long-range bearing, since it refers to means to satisfy this deep and enduring need of any freedom-loving mankind to be united culturally in a valid, contemporary, scientifically based, ethically valued insight. It has also immediate meaning for our own situation in the United States.

The United States of America had a beginning in a colonial frontier society, mainly of an agrarian and simple industrial kind. The prevalent philosophy at leadership levels was characterized by the peculiar 18th century faith in a just deity and a sublime order, held in a form almost as elementary as the society itself was simple. Freedom —socially consonant with order, not with chaos— could also be quite simply espoused, for the positive knowledge of order required to claim and express juridically the freedom of those Colonial days needed to be, and was, merely complementary to the simple social structure. Besides, the frontier was at hand.

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MAIN CURRENTS IN MODERN THOUGHT

A co-operative journal to promote the free association of those working toward the integration of all knowledge through the study of the whole of things, Nature, Man, and Society, assuming the universe to be one, dependable, intelligible, harmonious.

VOL. 7 NO. 3 AUTUMN, 1949 $3. A YEAR

"Ah, but a man's reach should exceed his grasp, or what's a heaven for?" — BROWNING

Editor: F. L. KUNZ Associate Editor: E. B. SELLON

CONTENTS

AIMS OF THE FOUNDATION FOR INTEGRATED EDUCATION

The corporate statement of Aims declares that the Foundation has been established:

1. To collect, create, and distribute authoritative materials which will encourage the development of unified overall concepts in education; to improve the balance of relationships between the physical sciences and the social sciences; to inquire into the phenomena of purposive activity in nature, man and the universe.

2. To assist teachers to understand and use such materials, and to develop an active, realistic, comprehensive philosophy which will communicate to their students the unity, coherence, and beauty of the world in which we live.

3. To remedy, solely by such educative measures, the conceptual and hence the ethical, social, economic, and political breakdown of our times, looking to a peaceful world order.

The members, associates, and staff of the Foundation realize that the progressive discovery of unifying over-all concepts concerning man and the universe is not a task to be performed successfully in isolation from the historical, social, economic, and political context of our times, nor in terms of application less than global.

The work of the Foundation is wholly educational, yet referred constantly to the contemporary scene in all its aspects, no less than to the total available wealth of human experience and knowledge.

The Foundation is incorporated under the laws of the State of New York as a non-profit educational organization. Contributions to the Foundation are tax deductible. Main Currents in Modern Thought, Quarterly, is the Journal of the Foundation.

MAIN CURRENTS IN MODERN THOUGHT is published quarterly to call attention to significant contributions to learning currently being made by leading workers in the multiple fields into which knowledge has come to be classified. It relates these advances to each other and to the classical and contemporary views of Eastern, European and American thinkers. It is designed to save time for the reader by providing a vantage-ground from which the whole world of knowledge may be surveyed and kept in proportion as it moves toward integration. Its editors assume that the principles of art, the universals of philosophy, the laws of Nature and Man as formulated by science, and the truths of comparative religion, can be orchestrated into a harmonic, meaningful, ethical body of teachings which can and should be made the central core of curricular study in the educative process at all levels of development. In condensing text, square brackets [ ] indicate editorial interpolation. Three dots . . . in the text indicates a word, phrase or passage omitted in the interest of brevity or clarity. Other usages are standard. $3.00 a year. Foreign $3.50. Contributors to MAIN CURRENTS enjoy full liberty of opinion and expression in these pages. *Port Chester, New York, to whom all communications regarding MAIN CURRENTS IN MODERN THOUGHT should be addressed. Entered as second class matter April 13th, 1946, at the post office at Port Chester, New York, under the Act of March 3rd, 1879.*

THE STILLWATER CONFERENCE

Continued from the Cover

Today our society is complex, our factual and technical knowledge is incomparably diversified, and the frontier is gone. While this was coming to be, the democracy devised the public tax-supported school system, an admirable instrument which could convey to the electorate the insight which is required for a good democratic society. We have thus the mechanism which we believe no previous known societies possessed, with which to disseminate a common insight, and to revise and improve that insight systematically as new knowledge might require.

Unfortunately the element that is missing in our picture today is that which most counts: *a contemporary and valid consensus as to what is man, what is nature, and what is their relationship in the intelligible universe. We do not possess that superior knowledge of the sublime order, in which we now need to frame and articulate freedom in the present social complex, nor do we systematically seek it.*

From the crisis in the world we in the United States are not isolated. On the contrary, our economic power has geared us centrally into the world transition. For lack of insight and pressed by world events, a deep anxiety has arisen among us, and a desperate and fatal choice is being ignorantly made. We are now spending most of our public concern, and vast sums of money, on physical resources and military might, and giving relatively little attention to the acquirement of the philosophy we need, and to its documentation in the educational system in such a fashion as to ensure that public policy shall reflect the gains made in enlightenment by the citizens.

If it be agreed that the most important lesson of history for democracies is that new knowledge should be assimilated into meaningful wholes, and thus lead to better insight continuously benefitting the educational system, finally reflected through the insight of all citizens in improved public policy, it follows that next beyond neglect and simple failure to carry out this principle, the worst possible disaster is to have the process reversed.

Emphasis upon force appears to be tempting us deeply into regimenting higher education itself, more and more. This tendency leads to a choking off of our best hopes of achieving a free consensus such as will allow us to confirm our ideals of liberty, constitutionalism, and justice at the level required by our now complex society. Impairment of free enterprise in education is therefore the most menacing possible event, whether the deformation comes from civil, military, or economic quarters. Such impairment most certainly destroys even the martial spirit itself.

Restriction is especially irksome just now. For into the content of learning has latterly poured, and is still pouring, a flood of new descriptive and factual knowledge. This forces upon us the task of re-organization and reclamation so as to get insight into order on the contemporary scale which is required to confirm the freedom which we say we want to see established on the global scale. It would be an irretrievable blunder if, when most urgently we need to get at this task, we were to be least facilitated, most hampered and incessantly distracted. No frustration could be more dangerous.

The great and perilously over-delayed duty we are describing needs to be taken up by scholars forthwith. They, working at the level of higher education, can begin the formulation, outlining, and programming of this work, although progressively it must become the duty of the whole body of educational workers to engage in it, at all levels, and in every decade. No quantity of mere literacy will compensate for the deprivation of quality which we are now suffering, a deprivation not of course of individual scholarship, but organized and socially meaningful philosophical talent unitedly addressed to starting the work on the required consensus.

The time is now, for along with the torrent of ill-organized and disproportionate information which overloads literate learning and depresses inherited wisdom and culture almost out of sight, a most hopeful circumstance is to be seen.

There may seldom if ever have been such an addition to reliable knowledge of universals as we have achieved since 1895. The instruments at hand, and our success with them in one great department of experience, namely, physics, are now such that a relatively small group of scholars commanding even modest aid can make a beginning at the great task. Once this work has been seriously begun, news of it will spread hope, and from that hope in turn a systematic, sustained, and finally world-wide development should quite naturally come about.

The role of knowledge in confirming and enlarging freedom is seriously and dangerously underrated. Freedom is not established by ideals, constitutional declarations, and inherited customs alone. It is a function primarily of knowledge and wisdom, conjoined with civil courage and personal integrity.

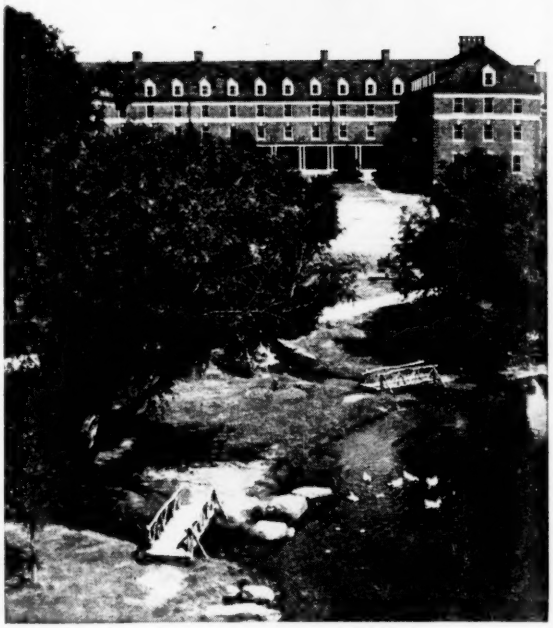
We know, for example, that at a physical level we have a freedom we call flight because we have come to understand some of the properties of matter and a few of the more elementary laws of nature. Only because we *know* are we able to *use* these factors, one against another, for relatively safe flight. It is no good having the courage or the aspiration alone. Icarus is said to have tried, but he was as short on sound knowledge as he seems to have been long on enterprise.

We do not make the laws which lead to flight. We only obey them intelligently. It is impossible to obey and use them unless we understand them. The progress of knowledge in the world and in the United States, first, and the courage of the Wrights, second, led to the triumph at Kitty Hawk, and so a new freedom was born. But at that very time when we won this new freedom, our society was growing so complex, and our knowledge pertinent to order in such a society was coming to be so fragmented and inadequate, that we began to suffer the impairment of political and economic freedom which is now so evident to any honest observer.

Considerations such as the foregoing suggest that the Stillwater Conference will be an event not only significant to those engaged in converting general education into truly integrated programs—as it most obviously promises to be—but important in an immediately practical, patriotic, and humane sense. A world consensus which displays an order suited to the freedom we defend is the true foundation for the peace which humanity longs to see displace the present nightmare of anxiety.

The Foundation for Integrated Education has conducted three provocative and enjoyable Workshops: University of New Hampshire, 1948, Wellesley College, June 1949, Montecito, California, August 1949. (The Proceedings of the first have been printed verbatim as *Issues in Integration,* 1948, and those of the second and third are in process.) Many lasting friendships rooted in a common great cause have been quickened in these happy ventures.

The Stillwater Conference, June 6-9, 1950, so generously and warmly co-sponsored by the administration and faculty of Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma, will add something of first-rank importance: a serious start at a systematic, co-operative attack upon major aspects of the central problem,



Stillwater — a Glimpse

namely, the rational-intuitive relation of science—that great creation so peculiarly the achievement of recent times—to man's priceless inherited cultural wealth in the humanities.

The principals, topics, purpose, methods, and provisional schedule of the Conference will be found on the next and succeeding pages, which are available on request in reprinted form, together with a registration form for delegates and auditors. A brief bibliography is also available for those who desire to establish a common ground by means of selected advance reading.

Since the illustrative materials used by resource leaders at Stillwater will be drawn from important curriculum categories, the advances made will be directly useful in curricular changes. Since the most searching light will be thrown upon method, the participants can be sure that they are working together upon common foundations, and not arbitrating opinion. Since the discussion will be free and full, delegates can make certain then and there for themselves that the gains are their own.

The comfortable quarters and well-known hospitality of our hosts at Oklahoma A & M ensures that a happy holiday spirit will accompany our adventure. It is fitting that in a region so recently our country's frontier we should engage in a common forward movement to new and wider frontiers of world freedom.

The program follows. F. L. Kunz.

THE STILLWATER CONFERENCE

on

The Nature of Concepts, Their Inter-Relation and Role in Social Structure

Conducted by the Foundation for Integrated Education
Co-sponsored by Oklahoma Agric. & Mech. College

at

STILLWATER, OKLAHOMA
JUNE 6-7-8-9, 1950

General Chairman: F. S. C. Northrop, *Yale University*
Co-chairman: Henry Margenau, *Yale University*

Arrivals and registration from 1:30 to 5 p.m. Tuesday, June 6.

The Conference will begin June 6th with community dinner (informal) 6 p.m. and an address:

EDUCATION FOR CITIZENSHIP IN A CHANGING WORLD

Kirtley F. Mather, *Harvard University,*
President of the American Association for the Advancement of Science, 1951, and President of the Foundation for Integrated Education.

Key sessions will be conducted by Clyde K. Kluckhohn, *Harvard University,* and Muzafer Sherif, *The University of Oklahoma,* as well as by the Chairmen. Conference delegates will be called upon to head group discussions.

The outline of the topics, leaders, discussion periods and plenary sessions will be found on the following page.

Please address registrations to the
FOUNDATION FOR INTEGRATED EDUCATION
60 East 42nd Street, New York 17, N. Y.

THE STILLWATER CONFERENCE

Purpose The Stillwater Conference, June 6-7-8-9, 1950, will center upon bringing into the concrete the nature, structure, and functions of concepts as symbols through the medium of which the integration of knowledge and common understanding can be effected. The aim of the conference will be to explore the possibilities of a unified conceptual structure as the basis for unifying group attitude and action. To this end, such topics will be studied as the nature of knowledge, formation of concepts, concepts as determinants of conduct, and integrated conceptual structures. The view of knowledge as dynamic as well as cognitive will be made explicit.

Discussion of the nature of knowledge will stress the place of experience, attitudes, subject-matter, and beliefs in the formation of concepts. Some reference will be made to the reification of ideas and to ideas as subsistent entities. The formation-of-concepts topic will emphasize logical, socio-psychosomatic, and semantic aspects and it will indicate the place of free assumption, empirical validation, as well as rational faith and belief. Discussion of concepts as determinants of conduct will develop such functions as the factual-understanding tie and the value-directive and include such questions as these: Do concepts mediate understanding? Action? What is the place of concepts in the formation of behavior patterns? Culture? The discussion will explore such matters as: the structuring of concepts and of conceptual patterns (integration and differentiation); the evolution, merging and convergence of conceptual structures; conceptual structure and generalization (nominalism, conceptualism, and realism); flexibility through alternative, equivalent choices; the unification of public and private conceptual structures through key-concepts.

Procedure A formal paper will be presented by each principal, to orient discussion, explicate a point of view, and raise definite questions to be taken up by small groups. These groups should bring back rather explicit reports, not necessarily conclusions. A report might refer back an outline of issues that were irresolvable for that group because of sharp issue, or general agreement that there exists insufficient knowledge, etc.

Plenum discussion will follow. The time reserved for a paper will depend somewhat on the wishes of the speaker, the times allotted in the program (opposite page) are therefore tentative. The definitive papers will be exchanged between the resource leaders before the conference, and the general chairman and group chairmen will therefore be well prepared for leadership of discussion. In addition a brief but essential bibliography will be supplied to all registrants upon receipt of written application.

Rates and Maintenance It is expected that all Conference members will be met at the chief air and rail centers (Tulsa, Perry, Oklahoma City) and brought to Stillwater and returned after the Conference, at no expense to them. Conference members will all be accommodated in a College dormitory to be designated later. Oklahoma A & M has just completed a large building program, and the accommodations will be unusually attractive. Wives of conference members will be admitted to sessions without registration charge, and at sheer maintenance cost. Other auditors accompanying delegates will be accommodated if space permits.

The rate for each delegate is $45, auditor (if accompanied by a delegate) is $35, wife is $12. (These rates cover all costs, including maintenance and registration.) *Attendance is not limited to official college delegates.*

It has been suggested that an institution may wish to send two delegates, or a delegate and an auditor, so as to be represented not only by the person judged by the faculty best suited to bring back the gains of discussion, but also the officer charged with the duty of administering the general education curriculum as it moves toward integration.

THE STILLWATER CONFERENCE

on

THE NATURE OF CONCEPTS, THEIR INTER-RELATION AND ROLE IN SOCIAL STRUCTURE

JUNE 6-7-8-9, 1950

HOUR	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Chairman of the day		F.S.C.Northrop	Henry Margenau	F.S.C.Northrop
8:45- 9:45		(1) Organization of the Conference (2) The Nature of Concepts and Conceptual Structures (Northrop)	Formation and Structure of Concepts (Socio-Psychological Aspects (Sherif)	The Special Character of Integration in an Individual Culture (Kluckhohn)
9:45-10:45		Small group discussions, headed by conference participants, to be selected from among registrants	Small group discussions (Headed as usual)	Small group discussions (Headed as usual)
10:45-11:45		Plenary Discussion	Plenary Discussion	Plenary Discussion (Led by Kluckhohn)
12:15- 1:30		Lunch Period	Lunch Period	Lunch Period
1:30- 2:15	Arrivals and Registration, etc.	The Methodology for Integration in Physical Science (Margenau)	Aspects of Methodology for an Ethical Science (Margenau)	(1:30 - 2:30) Small groups: Report on unclarified or unresolved issues
2:15- 3:00		Small group discussions (See above)	Small group discussions (See above)	(2:30 - 3:30) Plenary session Northrop: Concluding statement Adjournment 3:30
3:00- 4:00		Plenary Discussion	Plenary Discussion	
		DINNER		
General Evening Activities	Conference dinner address: Kirtley F. Mather Education for Citizenship in a Changing World	Open for later assignment	Open for later assignment	

THE GOOD NAME OF SCIENCE:

A Discussion of Science Courses for General Education in College*

Eric M. Rogers
Associate Professor of Physics,
Princeton University

How can we safeguard the good name of science among educated people? How can science courses in college and school give the general public a real understanding of science? The need is serious. This is a scientific age, in which the results of science affect everyday living, the thinking of scientists affects intellectual patterns and scientists hold controlling knowledge and skill in industry, in warfare, and in matters that affect commerce and government. Administrators in businesses and in governments have to meet with scientists and make decisions which depend on scientific judgments; yet they find themselves ill prepared to understand the scientists' point of view or to assess their statements.

Just as serious is the problem of the general public. Educated people emerge from school and college with little sympathy for science. Science is considered abstruse and difficult or else a little crazy. Scientists are regarded as wizards with mysterious knowledge which they hand out either reluctantly or overfluently.

Admittedly, this is too sweeping a condemnation. Yet how many of us believe that standard college courses make the best contribution to a nonscientist's education? At best such courses are interesting at the time; but they give little lasting benefit. At worst they produce bewilderment and dislike. Such results were sad in an earlier generation; now they are dangerous. The general student needs and deserves science courses that give him an understanding of science.

In recent years, there has been growing concern for general education courses in college to provide a civilized intellectual background in an undergraduate's education. With general education courses being planned and tried, serious questions are being asked about them by all who have the good name of science at heart. Each reader of this paper should pause and ask himself: What do I want my children to gain from their science courses? What do I want both the governors and the common man of the next generation to learn of science? Facts and laws? Or a friendly feeling towards science and scientists, and a delight in reading scientific books? Most of us, reflecting on such questions, find ourselves asking for teaching that will give genuine understanding as well as factual knowledge.

Since a number of new science courses have been started, those responsible for them are anxious to discuss aims, methods, and progress with others working on similar courses. The present article reports informally on two such conferences, one at Princeton Inn in 1947 and one at the Lamont Library at Harvard in 1949. Both were initiated by President Conant of Harvard, Dean French of Colgate, and Dean Taylor of Princeton. This article relates mainly to the first conference, discussing the need for new science courses in college, their aims, and their construction.[1]

Orthodox Courses and New Courses

In many colleges, the only science courses available for nonscientists are orthodox courses in single sciences, originally designed to provide a sound foundation for further courses. The emphasis is mainly on content rather than on ideas or scientific method, and there is not enough time to give thorough understanding. Their use for general education has been defended on the grounds that a thorough learning of facts and principles does give an understanding of science; and that routine work in classroom and laboratory gives training in scientific method which will spread to other activities in the student's life, making him more scientific.

When we judge such courses by their practice we find them crowded with material; and when we judge them by their results we find they do not turn out many general students with a sympathetic understanding of science. So we turn to planning new courses with two special characteristics: (1) they are ends in themselves, intended for students who will study no more science, except in their own reading in later life; (2) they aim at producing sympathetic nonscientists who understand something of the nature of science, who feel they know what scientific work is like, and what scientists are like, who have seen experiment and theory and critical argument used in building a structure of knowledge.

Transfer of Training

Our psychologist colleagues, however, give educators a serious warning about hopes that training given to a student in a science course will spread to other activities. Before we condemn orthodox courses or plan new ones, we need an answer to this key question: Will students transfer training

*Abstracted from *Science*, Dec. 9, 1949, Vol. 110. A similar discussion by the same author directed more specially towards physics teaching appeared in the American Journal of Physics, Vol. 17, No. 9, pp. 532-541, December 1949.

[1]Accounts of some of the courses discussed have been published in *Science in General Education*, edited by Earl J. McGrath (Wm. C. Brown and Company, Dubuque, Iowa, 1948).

from a science course to other studies or to life in general? If the answer is *no,* our new schemes offer little promise as part of general education. If the answer is *yes* our hopes should be granted.

In the past, educators placed great value on courses in classics, history, mathematics because they took it for granted that training in one field would transfer to many other fields and be retained as part of the student's general culture. In this respect, educators seem to have risked some confusion between *post hoc* and *propter hoc* — we might suspect the classical scholars had the intellect to succeed anyway. Since early this century there have been doubts about the hoped-for transfer. It certainly does not take place as easily as educators hoped.

If transfer does not occur at all, higher education seems almost worthless, except for specialized professional training. Fortunately there is some transfer — language teaching can improve intellectual skills, mathematics can give a sense of form or provide training in careful argument, and so on — but *only under certain favorable circumstances.*[2] These seem to be:

I. The more there is in common between the field of training and the field to which we wish it to transfer, the greater the likelihood of transfer. For example, if we train a student to weigh accurately in a physics laboratory, it is almost certain that this training will transfer to another physics laboratory; it is moderately certain that he will carry his good training to a chemistry laboratory; much less likely that he will carry it to any weighing he does in his own kitchen or in his business; and it is very unlikely that the training in accuracy will reappear as a habit of being accurate in other activities. Another example: training in argument learned in geometry is likely to be transferred to later geometrical studies, not very likely to be transferred to work in physics, unlikely to help the student to think critically about arguments in newspaper advertisements, and very unlikely to make him a better economist. (We can modify the gloomy doubts expressed in these examples by attending to conditions II and III.)

II. Consciously seeking transfer may help. We should encourage the student to review his gains in the field of study; then we should point out their applicability to other fields. We should even remind him that unless he transfers some of his gains to his general life, our course will be of little lasting value.

III. An almost essential lubricant for transfer is emotional attachment — the extent to which the student associates feelings of enjoyment, interest, and inspiration with his studies. Thus, to return to our examples a student who develops a delight in accurate weighing, making accuracy almost a minor ideal, may well carry the techniques and attitude of seeking accuracy far and wide in his activities, particularly if he has been made aware of the possibility and value of this wide transfer. The student who develops skill in geometrical argument and feels inspired by the method may well become the clearer lawyer or cleverer economist by the transfer of some of that training.

IV. It has been suggested that ease and amount of transfer increase with increasing general intelligence. This seems reasonable in the light of the other requirements. If this is true, the brightest students should profit most from courses in general education.

We now return with gravely increased doubts to the orthodox science course. The discipline of a physics course crammed with facts and principles, derivations and problems, may teach physics but it offers poor hopes of transfer. So those of us who want to give students an appreciation of science seek courses in which we cover less material and have more time for other uses in the course. If students are to learn about scientific method they will need more time to study the harder parts of the content carefully so that they understand what they learn — a headache over difficult material treated too fast would be a poor basis for transfer. There must be time for student discussion, for careful reading and clear teaching, for historical analysis, for arguments and for expositions of the nature of science; above all time for students to turn around often and look back on the way they have traveled, trying to understand what it is all about.

The New Courses

Realistic Aims. Turning the comments on transfer towards our aims for new courses, we again meet doubts. We doubt if we can give a complete conspectus of the basic principles of the physical and biological world, their implications for human welfare, and their influence on the development of thought and institutions, except a short-lived one that fades after the examination. We doubt if we can train critical thinkers. We are even doubtful about training students in scientific method with serious hopes of transfer; this seems to be asking too much. However, by leading them through a variety of scientific methods we may give them an appreciation of science which will transfer.

Content. The new courses should mediate between the layman and the scientist, between a classical culture and a scientific civilization. They cannot do this just by pouring in scientific information. They must try to give a sympathetic understanding of science and the way scientific work is done. To make this understanding a lasting part of people's culture is a huge task. In a one-year course we can give only glimpses of it;

[2] A useful 8-page report on this matter was published in 1930-31 by the British Association for the Advancement of Science.

and to do so will mean omitting at least half the orthodox course content.

We need have no fear that the new courses will lose all content and become easy talks about science. To achieve our aims we must deal with solid scientific material. Though we remove half the topics of an orthodox course, students may learn more rather than less in studying the rest more carefully, and may remember more material some time after the course. With an understanding of the nature of science they are likely to retain a lifelong interest in scientific reading.

The Block-and-Gap Scheme

In the conferences, we found a common element in all our schemes for new courses: the reduction of content to a smaller number of topics which are to be treated carefully as samples of scientific work.

To make discussion of schemes easier, I suggest the descriptions and names shown in Fig. 1 for various types of science courses. Let us represent the field of scientific knowledge by a table ABCDD^1 C^1 B^1 A^1, containing a vertical column for each science. (For example BCC^1 B^1 represents physics.)

The orthodox courses, labeled alpha and beta, proceed straight down a column, covering subject matter as thoroughly as time and the students' preparation permit, usually trying to lay a foundation for later courses. Beta is a standard freshman course. All the important topics are treated in turn, often with little time to show their consequences or their interrelations. History may be mentioned but it is certainly not brought to life. Beta is well packed with content.

Alpha is a "thin" or easy course which begins at the beginning and mentions topics thoroughly but avoids the hard parts of the treatment. (In physics, such courses are often recommended for students who have not studied physics before, and they are sought by many premedical students. In tests, easy numerical problems are more common than derivations involving argument. The student's real understanding is not inquired into.)

To meet the needs of general education, some have tried a survey course running all over the field of several sciences, mentioning as many topics as it can. Some people believe this kind of course gives the student valuable acquaintance with the sciences. Most of us condemn it as giving a useless smattering of facts with no time for discussion or real understanding. I have labeled this the "smörgasbord course." (The title "survey course" is easily misunderstood.) It is doubtful if this wild rush through many topics meets the needs of general education. Besides being too superficial, it makes science seem a glamorous wonderland, announced by the wizard-scientist — a damaging piece of negative teaching.

Putting into a diagram our prescription of less

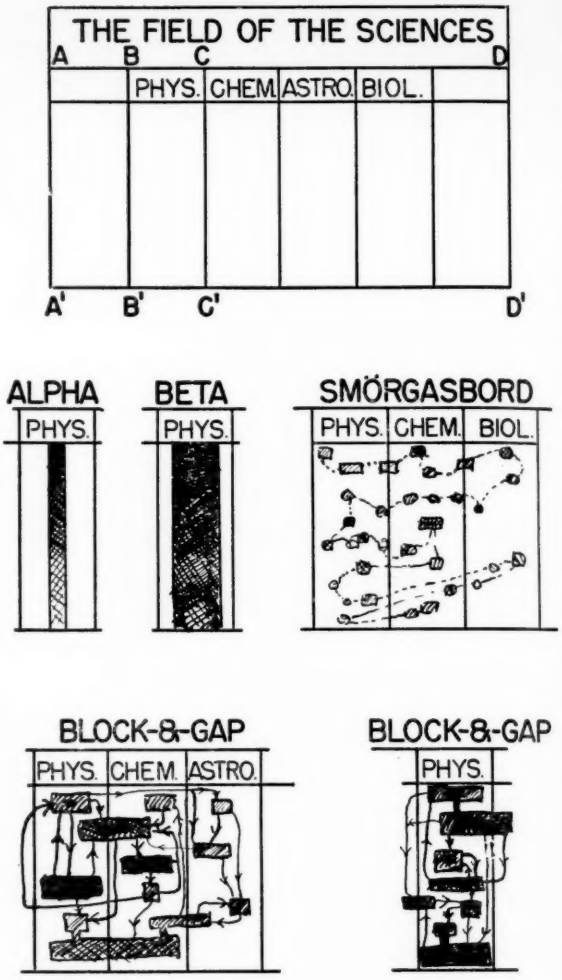


Fig. 1 Subject Matter in Science Courses

subject matter treated more carefully, I have sketched a scheme which I call a block-and-gap course. The blocks represent the chosen topics. They are taught thoroughly (so that the blocks are *dense*) and their background is explored (so that the blocks are *extensive*). Connecting the blocks are discussion lines along which flows the lifeblood of the course: historical studies, arguments about experiment and theory, ideas and information carried from one block to another — showing the organic structure of science. The gaps are essential; they reduce the content of the course so that there is time for discussion, time to see interrelationships, and time for the student to look back and reconsider.

The block-and-gap scheme is a mere artifice to

express general policy. It does not say what blocks should be chosen, nor how they should be treated. Each group of teachers should choose its own set of blocks — the conscious effort involved contributes to the health of the course. Those starting a course would be very unwise to choose too many blocks and thus return to beta.

Treatment of Blocks

At the conferences we seemed agreed on the restriction of content to a few blocks, on the insistence that the blocks be treated thoroughly, and on the importance of discussions, relating the blocks and commenting on them. But over the great question of how the blocks should be treated there was no general agreement. Probably, we may use any treatment that fits the interests of staff and students. The history of the growth of a piece of science makes the science itself seem clearer. So we expect historical treatment to be useful. To some students, scientific work remains unreal unless they try it themselves; so we find laboratory work advocated. Ordinary teaching methods can be directed towards our new aims; so we meet pleas for saving time and money by lectures. Here is a list of some of the methods being tried:

Case histories. This is the method suggested by President Conant in his book *On Understanding Science.* In the hands of well-informed, enthusiastic teachers, this makes a marvelous course for certain kinds of students. Cases from many sciences can be selected, giving a much fairer account of scientific work and thinking than selections from a single science. Many of us believe that students emerge from such a course with a real appreciation and understanding of science. This course uses original writings and accounts of research by great scientists. Help is needed from professional historians of science, for editing material and for arranging the course, and it is to be hoped that colleges will establish faculty posts for this purpose.

Study of original documents. This is a more extreme method, which encourages students to read original scientific writings very critically. Like the method just described, it needs good translations and reprints, many of them not yet available. Used alone, it is a slow method and probably should be combined with other methods, such as laboratory work.

Courses in the history of science. Excellent in themselves, such courses probably deserve to be preceded by a course in science and are better given in a special department. Conference members doubted that such courses would meet their aims for the general student, but felt they were almost essential in the preparation of future science teachers.

Orthodox presentation. This method makes use of lectures and laboratory work, etc., in the orthodox way, but with a new spirit. It is speedy and clear but lacks a needed flavor of genuineness unless combined with some historical treatment. The business of the laboratory is to give students close contact with scientific work, to make them aware of its difficulties, as well as its delights. The same sense of reality may come from careful study of case histories, so in that course laboratory may be unnecessary.

Teachers

What teachers are needed for such courses? Ideally we need a group trained in several sciences and in the history of science and in philosophy. Actually we find we can do well enough with a group of teachers from the usual science faculty, picked for their sympathetic interest. Frequent staff conferences are needed, but then the discussions are far more interesting than routine staff meetings. Out of the new courses themselves will come teachers for the next generation of new courses.

Integrity

However the blocks and gaps are treated, we need all through the course a certain quality of intentness and relevancy. We need to be intent on the future of the course and on the past. We should be intent on showing the growth of science from empirical knowledge extracted inductively to knowledge built into a structure of theory tested by experiment. We should make sure that reading and laboratory work and examination questions are relevant, above all in their attitude. We must aim directly at our goals, so that students can see and appreciate them.

Consider the teaching of scientific method as an example. Simply listing "method" in our program does not assure success. Routine drill in scientific procedure will do little good. Preaching at students a unique scientific method (devised by Francis Bacon) gives a stultified picture of scientific procedure which they may rightly reject as unreal. We should do better to have them find that science uses a variety of apparatus and techniques and then see that a problem can be investigated from several points of view. Finally we may be able to show there is a single underlying method: the way in which scientists build up a sense of assurance or validity about scientific results as they proceed from empirical knowledge towards established theory.

I call this essential quality of intentness and relevance *integrity* (with a slight flavor of integration). Without integrity, a block-and-gap course, run carelessly with a patchy mixture of topics, will be a failure — a tepid cafeteria meal. With integrity, we believe the new courses can do great things and are already succeeding in some measure, so that their students *will* maintain the good name of science.

KIRTLEY F. MATHER: PRESIDENT ELECT, AAAS*

Harlow Shapley

Harvard University

In the selection of Kirtley F. Mather as President Elect of the American Association for the Advancement of Science, the Council has performed a twofold service that is much to its credit. It has chosen a competent administrative leader, and it has properly rewarded a member who has not been excelled in contribution to the Association. For the past few years the major problems before the Association have been numerous and difficult. In this postwar epoch the Association has increased greatly in membership and it has passed through its centennial year into the important second century. In these years a steady hand and a cheerful spirit are Mather's contribution to the work and responsibilities of the Executive Committee. Throughout his term of service, which will now continue for three years more, he has been unquestionably and justifiably popular with the Executive Committee, the Council, and the membership of the Association.

Mather has had a wide and long experience in presiding over scientific societies and other organizations, and he brings to his new position also a personal fortitude that is needed in these days of nervousness about loyalty probes and the civil liberties of scientists. His record as chairman of the Civil Liberties Union of Massachusetts, as national president of the American Association of Scientific Workers, and even long ago in the defense of science at the Scopes anti-evolution trial in Tennessee, bespeaks his firm position as an outspoken advocate of American free citizenship. He has played a leading role in opposition to the recurrent proposals for "minority oppression" legislation in Massachusetts, and his skillful open debate with the Attorney General a year ago was a turning point in the fight for academic freedom in the Commonwealth.

In another aspect of the Association's work Mather is an excellent choice at this time. He seeks to maintain a spirit of integration and coordination among the naturally diverging specialized sciences. Our national scientific societies need leaders who may in the main be highly specialized in a narrow field, but who have wide sympathies over the whole modern picture. Primarily a geologist and geographer, Mather is also effectively concerned with all problems of natural resources, and with their relation to government and human welfare. His concern with natural philosophy (in the modern sense) and with religion, with educational experiments and progress, and with the art of taking special knowledge from the field of experts to the areas where adult nonscientific citizens operate, indicates the catholicity of his interests and activities. The titles of his recent books illustrate this wide and human perspective:

Adult Education: A Dynamic for Democracy (with Dorothy Hewitt)
Science in Search of God
A Source Book of Geology (with S. L. Mason)
Sons of the Earth
Enough and to Spare
Crusade for Life.

These are in addition, of course, to numerous technical papers that have in large part resulted from Mather's long association with the U. S. Geological Survey.

The new President Elect has throughout his life known many parts of America and many phases of American life. Born in Chicago and preliminarily educated at Denison and Chicago Universities, he has continued his education as teacher at the University of Arizona, Queens College (Ontario), Denison University, and Harvard University since 1924, and in numerous travels all over North America for the U. S. Geological Survey and with student groups. He has undertaken two extensive surveys in South America for a commercial company. In the past three years he has made trips through Europe that should be useful in working with international problems of the Association. Mather was the official representative of the American Association in 1947 at the meeting of the British Association for the Advancement of Science in Dundee, Scotland, and he has been both Secretary and Vice President of the AAAS Section on Geology and Geography.

His travels and his many acquaintances have naturally made Mather's public lectures outstanding, and have brought him into cooperative relations with many scientific, educational, and religious groups in America and abroad. In the summers of his early student years in the Midwest, before his geological travels began, Mather carried through the rather usual American program of experimenting with some of the tough realities. He has been office boy, factory worker, ticket seller, salesman. In later days he has worked hard at a different level. Some of these mature labors for the good of science and society should be mentioned. His "Scientist's Bookshelf" for the *Amer-*

*Readers of MAIN CURRENTS and Associates of the FOUNDATION FOR INTEGRATED EDUCATION will be interested in this account of the President of the FOUNDATION written by Professor Shapley for *Science*, the official weekly publication of the American Association for the Advancement of Science. Reprinted from *Science*, February 10, 1950, with kind permission of author and editor.

ican Scientist is probably the best periodical review of scientific books that is now available. His unique course in general education in Harvard University, "The Impact of Science on Modern Life," is for more than geologists; it is, in fact, given in the Department of Social Sciences. His work, as chairman, for the Massachusetts Civil Liberties Union has been mentioned. The "Mather Report" on the condition and problems of the American Academy of Arts and Sciences has been made the basis of the new policies of that ancient society. As president of the Newton (Massachusetts) Community Forum, and as an organizer of the Boston Center of Adult Education, he has shown his responsiveness to problems of his community.

These are only a few of the scientific and social activities of the Association's new President Elect. We can summarize by saying that he is practical enough to be an authority on the national petroleum resources, and idealistic enough to dream about a planet peopled with decent and well-fed world citizens. Both the practical and the ideal will be useful in the new post to which he has been elevated by the American Association for the Advancement of Science.

SCIENCE FOR THE NON-SCIENTIST

K. Lark-Horovitz*

Purdue University

> *"And I do hope that, in the present spirit of extending to the great mass of mankind the blessings of instruction, I see a prospect of great advancement in the happiness of the human race; and that this may proceed to an indefinite, although not to an infinite degree."*
>
> Thomas Jefferson, 1821

We usually say, "This is the age of science." Are we doing with Science and for Science what we could and should do?

"There are two objectives in American education, one to serve the students who expect to broaden their cultural background; the other to serve those who expect training for a specific purpose."** While subject matter is of utmost importance, the *primary* purpose of the schools is *not* to train scientists. It is important to bring to the attention of students and teachers such aspects of science which will particularly help to clarify the role that science plays in our present-day culture, and to understand how the social pattern has been shaped by applications of science and technology. The impact of the specialized science on neighboring fields, and particularly its influence on social problems should be stressed and we should bring to the attention of the non-scientist the importance of scientific discoveries.

The realization that science must have a place in general education is of late date, but its enormous importance for others than the science specialists is being accepted only slowly.

General education is the core in any non-professional or non-technical curriculum. As such it is not new and its program has followed for a long time a very definite pattern: an education in humanities and fine arts, and in philosophy including mathematics. It was supposedly the mark of an educated person to have a certain amount of understanding of the more abstract conceptional processes.

However, the rapid growth of technological development has led to introducing professional training courses into the secondary schools, the colleges and the universities. Thus, in many cases, a vocational program, together with the wide-spread abuse of the so-called elective system, overshadowed the cultural aspects of the curriculum. In opposition to this type of training there arose a movement to re-introduce classical education: the so-called "great books" movement appeared as another extreme on the educational scene. In the attempt to bring back the classics, too little attention was given to the *modern* achievements of science, particularly the importance of scientific discoveries in their philosophical and ideological setting. The clarification of concepts and ideas brought about by modern science was not enough appreciated.

The problem of science in general education is a new one, because the influence of science on our present-day culture is such that it cannot be considered any more a mere adjunct to the humanities. It must have its rightful place at the core of any educational undertaking. The recognition of this necessity is due to an increasing

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**A.A.A.S. Cooperative Committee on the Teaching of Science and Mathematics Thursday, December 29, 1949, 1:30 p.m., Symposium on Science in General Education.

understanding of the tremendous role which science has played in the shaping of our spiritual viewpoint. The biological and palaeo-biological discoveries of the last century were of profound influence on the religious outlook. The clarification of the mechanical, electrical and atomistic structure of matter changed the pattern of natural philosophy in the last fifty years.

In spite of these spiritual and intellectual aspects of scientific endeavor and in spite of the technological development based on scientific discovery, science is still not recognized as an integral part of general education.

General science courses in the elementary and secondary schools make an attempt to acquaint the young student with the simple and understandable "facts" of science. In most cases such a course is followed by a one-year study in the life sciences. Infrequent attempts to correlate physics, chemistry and mathematics do not have the desired result, namely: to give an insight into the type of thinking process characteristics of these sciences.

Numerous discussions in recent years have shown the growing interest of the colleges in the problem of science in general education. A recent survey shows that out of some 700 colleges only 20% state definitely that they have no program of science in general education; all the others have some type of science program fitting into the general curriculum.

What about the large majority of American youth who never go to college? This is a challenge to the science program in the secondary school which must be met.

Recognition of this problem has prompted the movement for science in the general education program which is now sweeping the country. It is too early to say whether these new science courses are successful. But it is clear to all of us who have an interest in science courses for the non-scientist that we are facing a number of problems which must be solved, and solved soon, if this movement is to be effective.

Let us consider, therefore, five points in particular:

1. Where are the teachers for the new courses?
2. What must we do to promote the understanding of natural philosophy?
3. How can we provide textbooks that will support this approach?
4. Do we have the collaboration of scientists and educators of science in general education for a cooperative program? and
5. What are the goals? We need recurrent evaluations of these goals.

(1) Evidently we face a new problem as far as teachers' education is concerned. The teacher in a general education course should not be specialized in one field alone; he must have a clear understanding of the connection between the natural sciences; he must have some background in the history of science and in natural philosophy. There are only a few universities in this country where teachers of this kind can be educated. It will be necessary to aid beginning teachers by seminars and analyses of textbooks from this point of view. Teachers' workshops must be established which will allow their training while on the job.

In-service training is even more important for the teacher in general education than it is for the college teacher of specialized courses.

The specialist objects to this type of education because he is afraid that the general science program will lower the standards of science teaching in the colleges and may be responsible for a delay in the career of science students. The fear of these educators is expressed by an old saying, "He who must make a living for himself or for others cannot afford to reach his profession late." These misgivings would disappear if scientists were to study the content of the general courses established in the centers of this movement. These courses have been developed with the aim and make a serious attempt to stress *concepts and ideas* instead of mere facts and memorizing formulas.

The teaching on the European continent corresponds to our own graduate schools. It is important to note that some of the outstanding scientists in Europe are also leaders in the field of general education.

A Ph.D. should be a philosopher not in name only. We therefore recommend that a study of natural philosophy be one of the prerequisites for the Ph.D. degree in science and mathematics. We also must educate the science specialists in the implications of science.

(2) Even more important than the problem of how to convince the faculty and the specialist staff of the importance of science in general education is that of educating our adult population to recognize the necessity of a sound science education. The urgency to acquaint the public with the achievements of science and the importance of their impact on the social background has prompted the development of new journals abroad. There is a new journal now being edited in Holland to link science and the community life. There is another journal in Switzerland, for scientists, but not specialists, *Experientia;* and in spite of the present difficult circumstances even Germany has a new journal called *Studium generale*. We also must make every effort to stimulate the interest in the philosophy of science. Unfortunately, our general reading public is not as responsive to science readings as we wish it to be. Early in 1948 the American Library Association reported, "Of all classes of books asked for in the public libraries of this country, that of science stood close to the bottom of the list. More than that, a decreasing interest in popular scientific books was evidenced at every side, both with adults and

with children."* This may be primarily due to the fact that laymen are not accustomed to actively study any material. As a consequence, after reading a few science books they get frustrated and only buy books if a big name appears on the title. To a large extent this situation is the fault of the scientists because most of our scientists are not science writers.[1]

(3) Texts of the type we have in mind are not particularly profitable. We must be able to publish a literature to bring science to the citizen. The American Association for the Advancement of Science could promote symposia on science in general education as a basis for creating the necessary texts which could be used for its proper study and university presses might well take the lead in starting publications that will contribute to a literature in the history and philosophy of science.

(4) It is necessary to bring to the attention of the scientific and educational societies the value of a cooperative program for teacher education in collaboration with scientists, educators, philosophers, and social science teachers. This is the aim of the Cooperative Committee of the American Association for the Advancement of Science representing some 20 scientific and science teaching organizations to provide a forum for an exchange of ideas.

(5) It is necessary to evaluate the goals of courses in general education, to test how far they have achieved their proposed objectives in comparison to the sequential courses in science, prevalent now. The main goal of this movement is to bring science to the people. That can only be done if the research men, in the University and industry, all take an active interest and a leading role in the necessary cooperation with teachers, educators, and administrators.

*Personal communication by B. Harris, science editor, Whittlesey House.

*This is substantiated by the following quotations from the American Library Asso. Bulletin, February, 1948, Page 80:
"Librarians were concerned about the almost non-existent public interest in atomic energy." "Except for sporadic interest from high school and college students, the decrease has dwindled until requests amount to practically nothing."
A.L.A. Bulletin, February, 1949, Page 59.

[1]William E. Larned, publishing director, Whittlessey House, in a talk pointed out that "the educational institutions have a responsibility in educating the people to understand that science is something not just for the specialist but a vested interest of everyone." Concluding, he said, "The magnificent response I had from our leading scientists when I wrote them for help and advice in tackling this problem is but one indication of their awareness of the need for good popular science books. I know that the librarians of this country are doing all they can to promote popular science literature, despite the lack of good books for the layman in many fields. Popular science books are worth pushing. We know today that this is a field we can no longer afford to neglect. Every American should have an opportunity to increase his understanding of science; it is up to us to give it to him."

SOCIAL SCIENCE AMONG THE HUMANITIES

Robert Redfield

(The following words conclude an article under the above title, in Measure, Vol. I, No. 1, a new quarterly which we review elsewhere. F.L.K.)

"Where a literate civilization, with people who reflect and organize thought, is built upon a local popular culture, there is plainly but one subject matter. There a new dimension of human living grows out of the local folk life. This is the 'culture' of China, or of India, in both senses. It is the culture and it is the civilization. This culture-civilization can be studied in part through the customs and institutions of the many. It can be studied partly through the art and philosophical writings of the few. And in the study the connecting links will appear: in the effects of Confucian, Taoist, Buddhist or Brahmin teaching in the village; and in the development and modification of ancient folk tradition in the more reflective writing and the finer art. In the United States we have come in recent years to speak of 'regional studies,' by which we mean the organization of teaching and research in terms of parts of the world characterized each by its way of life. Probably we mean not so much the study of a region as the study of a culture. Such a study might be completely humanistic, joining the way of study of the scientist with the way of study of those concerned with art and literature. We might say that for every such great culture there are two traditions, the Little Tradition of the village and the common people, and the Great Tradition of the reflective few. They are the two manifestations of humanity as humanity is locally and anciently organized in that part of the world. They have influenced each other, and one is a development out of the other. They can best be understood if they are studied together. To do this, social scientists and students of literature, art and philosophy will work together. Then the social scientists, without leaving their necessary connections with the other sciences, will turn from these neighbors on their right hand at the table of learning to converse with those humanistic neighbors who sit on their left."

A CORRECTION

In the previous issue of MAIN CURRENTS we failed to mention that the article, *Perception and Conception in Education*, by Dr. Frank C. Wegener, School of Education, University of Southern California, was reprinted with kind permission of both author and editor from *School and Society*. This omission, due solely to an error, we much regret.
F.L.K.

SOME ELEMENTS FOR THE SYNTHESIS OF A CONTEMPORARY CULTURE

Howard Lee Nostrand
University of Washington

In 1941 an informal group of University of Washington faculty members, representing fields of knowledge that spread all the way from musical composition to sanitary engineering, began piecing together their respective fragments of the modern mind. They had various purposes.

Some wanted to examine how other fields of knowledge affected the conclusions and the underlying assumptions of their own research.

Others wanted an analysis and a constructive view of the many-sided social or cultural crisis of our time. This was the purpose that prevailed when the group in its second year began offering a course, "Analysis of the Modern Cultural Crisis."

Yet the group itself has continued to be called the "synthesis seminar," on account of the purpose that had first brought it into being: to build a synthesis of our contemporary culture, such as we make in order to understand the culture of some past age.

The two themes of crisis and synthesis are too huge and too separate to fit into one college course. Yet the two lines of inquiry run somewhat parallel and touch at several points. From the beginning to the end of this course on the crisis we have needed a formulation of our common concepts of truth and values. We cannot agree on what is wrong with society except with reference to what would be right; nor can we agree on pragmatic implications of our analysis, except in the light of the practical goals we visualize. The way out of the crisis leads through a synthesis of common objectives, first among specialists in different fields of knowledge, then among the social groups comprising a culture or branch of any of the contemporary civilizations, and finally among the several great civilizations that must share the globe in our time.

The crisis course, therefore, has helped its faculty and student participants to answer three sets of questions. The first relates to disinterested research: Where do the assumptions and conclusions of each specialized field differ from those of one's own field, and how are the conflicts to be reconciled? The second set centers about the present world crisis: How did mankind get into this critical situation, precisely what is wrong with world society, and what does our scattered, specialized knowledge add up to indicate that we should do about it? The papers presented have been addressed explicitly to this set of questions. The third set concerns the nature of the civilization we want to bring out of the crisis: What can we agree upon as being of value, and by what method can we extend our common ground so as to reach a working agreement on practical decisions? In short, what are the vital ideas which characterize our regional branch of Western Civilization?

The need for a modern synthesis had previously been explored from several convergent approaches, notably certain unsolved problems of cultural education and cultural relations. A book manuscript, still not ready to be published, had gone so far as to define the need and certain resulting specifications, but had come to an abrupt halt before the problem of visualizing the one type of synthesis that appeared capable of meeting the requisite specifications.

The present essay will pass over the questions of exactly what types of synthesis are conceivable, which types could possibly meet the requirements, and the serious difficulties and dangers of misuse. Let us assume that the needs can be satisfied by a certain kind of synthesis: (a) not inclusive of the whole culture, but limited to the commonly acceptable *idées-forces* or ideas by which people attempt to guide their lives; (b) not static but changing; (c) not partisan, but recognizing the open questions and deep schisms in the culture; and finally (d), not uniform from one mind to the next, but accepted by each individual only in so far as he finds it convincing. Making this assumption for the purpose of argument, let us see what a synthesis of this type may look like, as it begins to emerge from one group's incomplete study of our north American branch of Western Civilization in the mid-twentieth century.

One result of the synthesis seminar is a sequence of questions useful for such study, as well as for the other purposes pursued by its various members. Indeed, the group's progress toward asking basic questions probably constitutes a more solid and useful achievement than the answers it has reached thus far. The questions are,

1. What methods are acceptable, in the culture under analysis, as roads toward generally agreed propositions?

2. What propositions of supposed fact about man and his situation, that are likely to affect his conduct, can consequently be generally agreed upon within the culture?

3. What ideals or values can be agreed upon by the acceptable methods as basic to the culture at its best and consistent with the best knowledge of man and his situation? What instrumental values can be selected to embody and apply the basic ideals?

4. What are the crucial discrepancies between the ideals of the society and its actual practice?

5. What social and technological means can be

selected by the acceptable method for cooperation within the culture toward the better realization of its ideals?

6. What propositions of method, cosmology, value, social analysis, and desirable action can be agreed upon as a common ground between this culture and the other contemporary cultures?

The exposition that follows will be limited to the seminar's central ideas under the first three headings: method, cosmology, and values.

Our emphasis upon common agreement must not be misunderstood. Agreement does not prove the truth of any position, but merely establishes its usefulness as a basis for harmony between individuals and between societies. This attempted synthesis is neither a new conception of ultimate truth, nor an effort to destroy other contemporary syntheses. On the contrary, it seeks to produce certain of the cultural conditions that might enable many different traditions to live together in the close quarters of the modern world. This objective, moreover, obviously calls for a continuing process of agreement rather than just a content agreed upon at some past time. The reader will have to supply a missing dimension of the present report, by imagining how the record of one group's adventures may serve as an impetus for new cycles of individual growth and cooperative achievement.

The Method of Establishing a Working Agreement

The only means for establishing common agreement in our culture appears to be the process of reasoning inquiry, applied with all the rigor permitted by the materials at hand. This process the seminar found it most convenient to call scientific method, bearing in mind however two great dangers of oversimplification.

First, scientific method is not all one process. It differs, as F. S. C. Northrop[1] has shown, according to the field of knowledge and the stage of inquiry in which it is applied. The seminar agreed, however, that reasoning inquiry can rightly be applied in every field, from the mathematical sciences to the realm of values, and at every stage of inquiry, from the analysis of perceptions and listing of hypotheses to the induction and the deductive application of descriptive or normative conclusions. All the members of the group agreed further that they can accept the results of this process, provided the inquiry is conducted with all possible rigor, and its results are offered as tentative and not final. The most exacting form of inquiry practicable in each instance the group found it convenient to identify as scientific method.

The second danger is that of overgeneralizing the results achieved by scientific method. While the method does serve to establish points of common agreement, it would be the fallacy of a narrow positivism or scientism to suppose that the method disproves any beliefs, or discredits forms of experience, which may lie outside the orbit of its analysis.

The only necessary points of a working agreement which do not admit of proof are five minimum postulates, three to serve as the basis for epistemology, one for logic, and one for valuation—

1. The experiencing self exists at the moment.
2. Memory is to be regarded as valid except where analysis indicates the contrary.
3. The non-self reported by the senses is to be regarded as existing, except where analysis indicates the contrary; and it may be expected to continue existing, with such consistency as to permit useful predictions.
4. A proposition and its opposite cannot both be true.
5. The realization of human value should be maximized.

"Perceptions," the raw materials of the scientific method, included both simple sense perceptions and the complex perceptions we meet with in ethics, esthetics, and religion. Objective analysis of these complex perceptions is made the more difficult by accompanying emotions such as reverence or esthetic enjoyment. How far they can be broken down by analysis remains an open question. It is agreed however that they should be analysed as far as our examination can penetrate, in order that we may gain as far as possible two benefits of reasonable inquiry: a common working agreement and the accurate adjustment of the individual to his environment. It is agreed, too, that the intellectual integrity of a person is to be measured by his willingness to alter a belief when his reason requires it.

We all rely on tradition—inherited patterns of behavior and their implicit value judgments—to establish for us both values and means toward their realization. We are right to do this in those many cases where we must act and yet either no decision is necessary (e. g. whether to wear clothes) or there is no opportunity to think out an alternative. Yet tradition cannot establish truth about realities or values, at least for the purpose of common agreement. Truths can be established only in the form of propositions and these, to be convincing, must meet the critical standard of the scientific method as we have defined it. The great importance of tradition, as a counterpart of inquiry, springs from the fact that while reason can go anywhere common agreement is needed, it cannot go everywhere if only because our time and energy are limited. The serviceability of tradition in most areas of our conduct allows us to concentrate the slow process of reason at the points where it is most needed.

It is an open question whether intuition should be included as a second valid means of establishing truth about realities and values. The prominence of intuition in Oriental philosophies, together with its frequent appearance in the West, calls for

[1] F. S. C. Northrop, *The Logic of the Sciences and the Humanities* (Macmillan, 1947).

further examination of the question. Meanwhile the seminar has decided against counting intuition as a separate method, for five reasons. (1) To let in any intuition makes it difficult to exclude the popular "hunch" as a valid form of evidence. (2) Even critically defined, intuition appears to include the "natural reason" of the eighteenth century, which was subsequently abandoned because it gave such contradictory testimony under diverse cultural influences. (3) Intuitions in the sense of complex perceptions have been included among the basic materials of the scientific method. In order to treat such perceptions, as a source of knowledge independent of the scientific method, we would have to abandon our principle of subjecting all perceptions to the most critical examination possible. (4) To remove these complex perceptions from the province of scientific method would lead to the questionable dualism of scientific reason vs. some other sort of reason, and would help to perpetuate the false notion that the rational conduct of life is independent of these complicating elements. (5) Present knowledge of physiology, psychology and sociology indicates strongly that any complex perceptions must comprise earlier perceptions. Hence no complex intuition could possibly be an irreducible perception.

Neither intuition nor tradition can qualify, then, as a method for establishing common agreement among individuals and cultures. The scientific method as we have broadly defined it remains as the only acceptable method for this purpose.

Individuals may reach conflicting conclusions by the scientific method, through any of our causes. (1) Different individuals may begin reasoning from different portions of knowledge. The remedy here is obviously to consolidate the facts they know. (2) They may conduct their discursive reasoning, which seems to be in itself uniform in all cultures, according to conflicting postulates. (This is the view which Franz Boas maintained against Levy-Bruhl, who had thought primitive man to be irrational.) We can only hope for a gradual natural selection of postulates on the grounds of their relative usefulness. (3) Individuals may differ in what they admit as evidence. In the long run, however, the more rigorous standard has tended to prevail where conflicting criteria of evidence have been the cause of disagreement. (4) Individuals may differ in emotional disposition, particularly as between a bolder and a more cautious decision on the basis of the same evidence. Disagreement of this sort is insurmountable except as individuals may at times override their own inclination, preferring the advantages of harmony or the relative safety of a collective judment. Yet a working agreement can take this much difference of opinion in its stride, provided we keep our sense of proportion and cultivate a sympathetic respect for other personalities.

Man's Nature and Situation

The human being is not entirely a rational animal, but passional and purposive as well. Concepts influence, but do not control, our emotional dispositions and our actions. Furthermore not all our concepts are rational. Yet human nature is rational to this extent, that in the long run we tend to select the more rationally tenable concept or action and to reject the less tenable. The question of free will must of course be left unsettled. Man does appear however to possess a limited freedom to make rational choices; such freedom follows as an inevitable corollary of the common-sense view expressed in our first and third minimum postulates, that consciousness is real and is surrounded by a real world. For then the experiencing self, as a part of reality, not only may undergo influences from outside but it also may exert influence of its own. Dissention from this majority view does no harm to a working agreement, for those who logically deny the existence of free will are none the less able to strive and to cooperate on common projects.

Purposiveness is innate as a formless potentiality. It takes form under the combined influence of the outside world and the individual's own developing contribution toward his "personality."

Human nature is plastic but forms resistent habits. Man has few instinctive patterns of behavior. Since nearly all his behavior patterns are consequently learned ones, man has an immense potentiality to change his behavior, either as he is forced to do so by new conditions or as he rationally modifies himself and his society. On the other hand, man pays for his freedom from instinct by running a constant danger of harming himself through the lack of automatic safeguards. The rational changing of individual habits or group attitudes is simply a matter of patient educational effort, guided by an analysis of the undesirable habit into the "cues" that that are to be reoriented. We must modify the cliché that "You can't change human nature."

Human populations are so similar to one another in biological endowment, and consequently in their potentialities for acculturation, that for all purposes except possible hypotheses of scientific inquiry they must be regarded as equal in their total capacities for achievement. All human population are genetically linked together. Culture influences race, at least through technology, while race, as distinct from notions of race, influences culture little or not at all. One marked influence of technology on race has been to accelerate the process of miscegenation.

All human beings have in common a few elemental needs, which furnish the basis for corresponding human values. The chief of these needs seem to be health, and freedom from want; some balance between security and adventure in one's economic, emotional, and intellectual life; self-esteem and faith in some fairly immediate mean-

ing of life; self-expression, freedom for self-development, and perhaps a need to transcend oneself; love (sexual, familial, and friendship in larger groups); recognition; and a satisfying tempo and rhythm of exertion and relaxation. As cultures come into closer contact, these elemental needs express themselves in more and more similar problems and interests from one culture to another.

Human knowledge, thought, and belief are bounded by our psychological limitations, including emotional drives and habitual associations of concepts. Thinking and believing are no process of pure reason. They play a functional part in the adaptive process of an organism, and they have advanced only where human drives have provided the motive power. Our knowledge is not absolute truth reflecting simple universal principles, but tentative approximations, elaborated as far as has seemed useful, within limited fields of validity. As Professor Randall reminds us in one of his chapters full of concepts at the height of our times, ". . . philosophy is primarily a means of criticism, a leverage for attacking, defending, or reconstructing tradition . . ."[2]

Furthermore, no verbal formulation can express the whole truth of any proposition. Language is but an imperfect system of symbols for alluding to realities and to our evolving interpretation of them. Goethe has expressed vividly the allusive character of all we build with words: "Alle Theorie ist grau, grün nur des Lebens ewiger Baum." Today as in primitive times we have frontiers where we find it difficult to deal with realities, either through a lack of convenient symbols or through confusion of the symbols with the realities themselves.

We have good reason for the cautious distrust of generalizations which marks the culture of our age. Yet we need to avoid the extreme of an unproductive "debunking" spirit—the extreme of being duped by our own incredulity—as well as a tendency to react against this extreme by picking some object of a credulous faith.

In spite of the human limitations of our understanding, reason is an adaptive pattern of untold possibilities. It has made man's whole environment, from the intimate medium of thought and language to the remote world of astronomy, a matter of organized, critical knowledge. While the individual can only sample this knowledge, he can learn enough of all fields to grasp their vital ideas in a critical spirit, and to take part in harnessing the special competences of experts to the guidance of his own life and of society. Ignorance, today at least, is a bad thing. The individual or population that neglects the power of modern knowledge not only increases its own risk of unwise judgments, but also tempts forth the potential injustice of those whose purposes are more powerfully implemented.

Our exact knowledge of the physical cosmos gives unprecedented control over it, but settles none of the questions about its ultimate explanation. Individuals differ in their belief as to the existence of a Divine Being or cosmic drive reinforcing man's good intentions. No one can really weigh the evidence as to whether the universe is benevolent, hostile, or indifferent to man. The scientist who expresses an opinion on such questions speaks as a metaphysician and without the support of his science.

The lack of agreement on ultimate explanations does not impair the agreement on practical purposes to any dangerous extent. Naturalists and religionists agree that whatever the odds, it is good to strive. Their disagreement as to the conditions in which we strive boils down to the open question of whether the universe is *guaranteed* to be, or simply *may* be, so constituted as to afford man a possibility of succeeding in his purposes.

But despite the many differences of belief that remain among educated people and may remain throughout human history, our greatly increased knowledge of the physical world has cleared a new ground of agreement which people of the most diverse faiths can share. Our extended control over our physical surroundings means more to us than just the convenience of being able to dam up a great valley, or to fashion tailor-made molecules into plastics.

We have come to expect more of ourselves. We expect technology to serve human welfare, and we cannot accept our own excuses for achieving less. We have gained the chance of wide agreement on the physical means toward human welfare, provided we can agree on the objective.

We have developed at the same time an expectation that we shall learn still more in the future. Concepts of earth and sky, of time and space, that once were stoutly maintained to be absolute certainties have given place to entirely different concepts, more accurate and servicable. We cannot but hold our present opinions more diffidently; and as far as this attitude extends, it makes human relations more congenial.

We have gained freedom from many of the fears that tormented our ancestors. No longer are the woods and the air around us haunted with capricious meddlers, and the high heavens peopled with irresponsible throwers of thunderbolts. Where once man projected his own world of scarcity and conflicting personalities we have learned to know a nature unbelievably intricate and beautiful. Our earth is not the center of the cosmos, nor are we ourselves the center of its kindly or malevolent attentions. Yet the physical cosmos we see today, by its very remoteness from all anthropomorphic terms, enriches our lives in a new way. We return from the marvels of the microscope and the spectroscope with a heightened

[2] J. H. Randall, Jr., *The Making of the Modern Mind* (Houghton Mifflin, *Revised Edition,* 1940) pp. 579-80.

feeling for the fullness of our world, a new sense of sharing a certain expansive emotion of admiration or reverence with our fellow men, and one or two ideas pregnant with poetic suggestiveness, such as that abundance rather than poverty, and interdependence rather than self-seeking, are characteristic of the natural world.

Educated people of all faiths cannot but share a common admiration for the physical scientists who have achieved so much. and consequently, a common respect for the virtues these scientists represent—their bold imagination and patient reasoning; the selfless spirit in which they share their results; and the intellectual integrity which has led them on to unbelievable discoveries while the charlatans found only what earlier errors had led them to expect.

Our advancing knowledge of numbers has made vital contributions to culture as well. The mathematicians have taught us *how* to think with more scrupulous and effective intellectual integrity. They have taught us how to formulate generalizations with a new precision, and to apply them to new materials. They have led not only the advance toward greater precision but also another advance, toward the realization that relationships, as well as things, constitute an important part of the world we need to understand. We owe primarily to mathematics the discovery that concepts seemingly self-evident such as the common-sense view of space and time, may really be arbitrary, conventional interpretations of our environment—useful, but not necessarily the most useful for all time.

Our knowledge of biology, though less exact than our knowledge of physical science, bears upon human life in much the same ways. It affords unprecedented opportunity for control over a large part of our environment, while it sheds little or no light on the final causation of things. As a part of its humane significance, it provides men of all faiths with a common heritage of epic achievement and common respect for the virtues of the scientific attitude.

The highest generalizations we can build on biological science, such as that all organisms live by oxidation, or that photosynthesis is the source of all nutrition, leave us none the wiser as to our ultimate reason for being. But our empirical knowledge does enable us vastly to improve the biological foundation for achievement at the higher level of distinctively human values. Knowledge of human eugenics is limited by our unwillingness to experiment on humans, in view of values we put above knowledge. Present knowledge makes it possible to advise prospective parents of defects that might appear in their children; it is generally felt however that society should not go beyond advice, in applying knowledge of biology to human procreation. It is consequently only of academic interest that we possess enough knowledge for scientific experimentation, but probably not enough to propose a program of applied human eugenics. On the other hand we have made great strides, and could be making even greater ones, in the field of euthenics—the improvement of the race through its living conditions, particularly the more efficient use of natural resources, better nutrition and health habits, scientific control of disease and pests on a world-wide scale, and more enlightened child training.

Biology has contributed several specific *idées-forces* which help to liberate the modern mind and tend to unify it.

The greatest of these is the idea of evolution: the disposition to expect growth and change in all that pertains to living creatures, and consequently to make a saner emotional adjustment and wiser provision as "the old order changeth, giving place to new." (The physical cosmos seems incidentally to show no true analogy to the evolution we find in the life sciences. We do find, throughout all the natural sciences, a constant change which underlies the directional change called evolution.) Man is himself an unstable equilibrium, and so is his entire natural environment. Hence to set our heart on any sort of quiescence as a goal of human life would lead us to inevitable frustration.

Biology serves humanitarian ideals by gradually clearing away the superstitions relating to physical and psychological abnormalities, or to the superficial physical differences within the human race. Knowledge of our biological self also supports a more understanding attitude toward self-discipline, and toward the conduct and the individual differences of our associates.

Biology is coming to reinforce the idea of cooperation. The "togetherness" of the physical cosmos finds an analogue, more suggestive for human society, in the advantageous social cooperation of organisms like the ants, termites, and bees. Cooperation is just as basic a relationship among living creatures as competition, which a few decades ago seemed the only law of human relations.

The intermediate position of biology, between the physical and social sciences, lends a special significance to its successful employment of the scientific method as a means toward human welfare. Medicine and surgery, after a stagnant descriptive stage of 2300 years, made astounding progress as soon as they borrowed the experimental procedure of the physical sciences. On the horizon today looms the vital idea that if we will only go a step further and apply the same experimental techniques to social problems, we may be able to push back the great frontier to which, above all others, our century is of necessity addressing itself.[3]

[3]For a fuller discussion of ideas arising from natural science, as they may be applied to the social sciences see Oliver Reiser, *The Promise of Scientific Humanism* (New York: Oskar Piest, 1940) Part II.

We must not forget however our principle of distrusting generalizations—particularly where we are extrapolating beyond their field of proved validity. We must not mistake a mere suggestive analogy for a working principle critically applied to a new field by speculative philosophy. It seems necessary to introduce among the vital ideas of our time, as an alternative to such over-generalization, a concept of diverse orders or *levels* of phenomena. Grains of sand poured from a funnel are in a sense predestined to form a cone; yet at the *level* of the individual grain, we cannot predict what place it will occupy in the cone. The atoms in a piece of wood or iron can be counted on collectively to behave in a certain fashion, and Newtonian mechanics is still after all the basis of our great achievements in engineering. But the principles we once took as absolute truths now appear as statistical truths, of the same nature as the truths of the social sciences. At the level of astronomical sizes the Newtonian generalizations are too inaccurate to serve, and at the sub-microscopic level they simply do not apply. It was a mistake to hope, even in the case of physical matter, that we might induce simple laws from a desultory sampling, and use them as keys to unlock the secrets of a clock-like universe. It would be equally fallacious to argue that a subject like history cannot apply the principles of the scientific method at its level of phenomena, on the ground that its materials must first be reduced to the same laws that apply in the natural sciences.[4]

The *concept of levels,* which seems inescapable, would remove from our culture the reductive materialism of the nineteenth century and the reductive rationalism of the eighteenth. No longer can one reason that since a principle like determinism explains what happens at one level it must therefore be the key to the whole simple universe. No longer can humane values be ruled out or explained away, on the ground that there is no place for them to enter into the "real" world of phenomena at the level of mechanics.

Many fields of learning have made vital contributions to our knowledge of man's situation in society. A synthesis must of course organize these contributions not according to their diverse origin, but according to their bearing on one another and their total significance. We may logically begin with what we know about the nature of society in general and then narrow down to the specific problem of the contemporary crisis and the conditions for its resolution.[5]

We cannot count on social conditions to serve human welfare automatically if left alone. Nor do we regard institutions any longer as intrinsically sacred and inviolable. Social conditions and institutions exist in a state of unstable equilibrium. They evolve, and they can be influenced by man. They are instrumentalities which man must improve, if he would strive effectively toward a better society. The rational attitude is slowly but surely spreading over the domains that have belonged to *laissez faire* theory and to the earlier but more persistent attitudes of superstition and symbol-worship.

Since human nature is capable of an almost limitless variety of habits, human cultures have a corresponding capacity to be different from one another and from their own past stages. The only limits are the basic human needs which must somehow be satisfied, and the close interconnection of the factors in a culture's multilinear evolution. Any but the most general laws in economics and the other social sciences necessarily presuppose a great many surrounding conditions. They are like very complex equations, in which all but a few of the variables have been assigned some fixed value, reasonably accurate for a given culture at a given time. But none of our laws is at once so general as to include all the possible directions our civilization might take, and so definite as to serve for specific predictions.

One important general law is that all civilizations rise gradually to an apex of creativity and then decline. This law does not permit us however to plot precisely where we now stand on the general curve, or how rapidly our civilization will decline, so numerous are the complicating factors. The analogy of a culture's evolution to the lifespan of an individual organism appears to be highly misleading. A closer analogue in the organic world is the phyletic type, which like a culture evolves at no fixed rate, and ultimately either dies out or evolves so far that we find it more serviceable to distinguish one or more new types. Arnold Toynbee quite spoiled the neat rigidity of the original cyclical theory when he showed that a creative minority in a declining period can decidedly influence the character of the cycle that ensues.

In its bearing on the present, the cyclical theory at first seems diametrically opposed to the other great interpretation of Western history as a gradual if meandering progress of democratic institutions, from the slave society of antiquity to feudalism and thence to the accelerating rise in status of the common man during the last few centuries. The fact is, however, that these two great interpretations of the drift of our times complete rather

[4]For the application of the concept of levels to history see Herbert J. Phillips, "Philosophy of History as a Guide to Social Action," in *Victory for This,* University of Washington (Bookstore) 1944, especially pp. 49-50.

[5]In the last chapter of *Intercultural Education in American Schools* (Harper, 1943) Messrs. Vickery and Cole have listed some 54 "Important Concepts in Intercultural Education" (pp. 148-182). These concepts illustrate how the present elements of a modern synthesis may be expanded in one important direction. They also show interestingly that two independent efforts to formulate vital concepts of our time may arrive at entirely compatible results, while differing in their wording, arrangement and emphasis.

than contradict each other. The Spenglerians appear to have applied the cyclical theory too literally to the present. The admitted weight of its evidence supports the likelihood not necessarily of a "new Caesarism" but simply of *some* form of economic and political unification. The great drive of our historical cycle, as it enters upon its "winter," favors almost anything but the continued particularism which some political theorists have feared will prevent the consummation of an organized world order. The trend is not at all incompatible with a continued rise of the common man.

A second important general law is that technology progresses. From one civilization to another no major development has been lost; the gains have steadily accumulated. Has there been an analogous progress in the realization of humane values? It seems impossible to substantiate any cumulative gain since the earliest epochs, in point of the abundant life as it has been realized through the ages by a few individuals. It seems equally impossible to prove that the arts have progressed since the dawn of civilization. Progress has been made however toward the universalizing of an abundant life. This has been one of the direct results of the progress in technology itself. And the consequent sharing of excellence with others appears moreover to constitute an advance in the good life of the individual. Of course the accelerating rise in status of the common man since classical antiquity may constitute only an advance in external conditions: an opportunity that may not be utilized. Yet the egress of means does seem in fact to have occasioned some progress in the realization of values. Since the days when a Cicero turned his sympathetic eyes aside from the problem of slavery, humane feeling has gained the reinforcement of a new sense of obligation, a new hobby of social justice. Increasing longevity, together with progress in social organization, may even be producing in our time a new ideal of human personality. But here we approach a matter that we should leave for our discussion of values.

The concept of a contemporary crisis figures prominently among the directive ideas of the present generation. After World War I many people still hoped for progress through *laissez faire*. After the Great Depression, many hoped that we might retrace our steps back to normalcy. After World War II, we are prepared to discover that we must resolve an underlying crisis of our whole culture before the world will be safe for good individuality. The idea that man must make his own social conditions now implies a more persistent and comprehensive effort than has seemed necessary before.

Accordingly the present generation is producing analyses in many fields that throw light on the nature of cultural crisis. Toynbee has led the historians, in observing that where cultures have failed to make an adequate response to the challenge of their times, the failure seems to have been due largely to a rift between the leaders and the folk. Other social scientists have explored the nature of maladjustments among social forces, and by contrast the nature of a dynamic equilibrium of forces, appropriate to the unstable, evolutionary character of living creatures and the society they compose. The economists especially have made progress toward defining a dynamic equilibrium in their field. Still others have addressed themselves to particular factors which stand out in the current crisis: maldistribution and underconsumption; the idea that want is no longer necessary and the dissatisfaction of underprivileged groups; racist and nationalist attitudes unrelieved by supranational and local loyalties; the uncoordinated state of knowledge and its effect on the specialist, the artist and the common man. Philosophers and educators have been so sharpening the meaning of the general insight that the capacity to orient ourselves toward sound human values has not kept pace with the swift development of technology.

Telling efforts have been made likewise to catalogue our resources for meeting the challenge of the current crisis. We have the means to run a civilization without exploitation. We can so universalize physical well-being and education that all peoples and minorities may be able to stand up for their rights, and to contribute in a healthy spirit toward wise social policies and an abundance of material wealth and the higher human goods. Longevity, which has doubled since the Renaissance, greatly prolongs the productive period of many great men like Edison, Einstein, Whitehead, John Dewey; and it increases the potential wisdom of a whole democratic electorate, provided health and creative leisure can offset the danger of senile attitudes. Intercultural contact, with the great expansion of geographical knowledge, gives us the opportunity to grasp the world-wide interdependence of science, the arts, economic prosperity and political security and justice.[6] The science of statistics permits us to formulate and then to dramatize social objectives such as the control of the business cycle, a given level of employment or purchasing power, and even the relief and rehabilitation of distant populations. Statistics has made possible a new enthusiasm for cooperative achievement, at danger points which in earlier times remained unappealing and unconvincing.

In sum, experts can now offer the means of bringing about virtually any economic or social conditions we may desire. They can predict the cost of each alternative. Man's purposes are so powerfully implemented today that we need no longer fear our impotence so much as our unwise management. The pivotal question now is the values which individuals select to strive after.

(*To Be Concluded*)

FIRST GRADE CONCEPTS OF HOT AND COLD*

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Children of First Grade were chosen for these studies because research on the ages represented by this level are not as extensive as those for higher grade levels.

These concepts of Hot and Cold were obtained by use of a procedure [in which] free conversation is an essential feature. The children are asked to talk about selected topics. There is no interrogation. Particular answers to particular questions are not sought. Particular lines of response are not suggested. Discussion follows the desires of the children.

Twenty-five children comprised the class. They were pupils in the First Grade of the Laboratory School of the New Jersey State College at Glassboro. The group was taught by the regular classroom teacher. The teacher incorporated suggestions from the author. The author observed and recorded. The range in I. Q. was from 102 to 133. The range in C. A. was from 5:6 to 7:5.

What categories describe the content of the responses of these children? These children talked about Hot and Cold in terms of Production, Effects and Thermometer. There was little overlapping. The concepts are presented by categories.

THE CONCEPTS

The statements are given in the words of the children. The order of array is not theirs, however. For example, several of the children interspersed remarks concerning Thermometer with those concerning Production.

Production

On play trains the tracks get hot.

My sled made sparks once when I went down hill. I had to put snow on the sled, it was so hot.

Put oil on the stove and the oil will get hot; sparks leave sometimes.

The transformer on a play train gets hot—the wires burnt off.

Scouts take a magnifying glass and make fire on paper.

You can make heat by putting your hand on the table and the table will get hot.

Effects

The snow man disappeared and went right into the air even while the wind blew. But the wind did not blow the snow man over.

We would have fog and rain all of the time without the sun.

You can tell if it is warm by feeling a piece of glass.

Thermometer

The mercury stretches in the heat

Heat hits the little silver thing and the little thing goes up. The mercury goes up.

Cold air makes it go down.

The air makes the thermometer get bigger.

ANALYSIS OF THE CONCEPTS

This analysis is made, primarily, for teachers and prospective teachers. Attention is given, however, to several problems that are of interest to students of child psychology. Accordingly, the discussion seeks to balance theory and practice.

Production

These children speak in terms of five methods of producing heat: Friction, Oxidation, Transformation From Electricity, Transformation From Light, and Conduction. The data yield no evidence that these children could have defined any of these five methods [or] classified their own remarks. An important problem is involved here: to what extent could children of First Grade level be taught to abstract such methods and therewith classify their experience?

The frequency of statement is greatest for Friction and least for Transformation From Light and Conduction From the Body. Frequencies such as this might be used by teachers as guides to experiences that have not been shared by many children in a class. Thus, in this case, we could proceed with instruction relative to Friction with provision of fewer basic experiences than with instruction relating to Transformation From Light.

Influences of environment on the formation of these statements are evident. Most describe experiences that are possible for children of every social and economic level. But the statement, "The transformer on the play train gets hot—the wires burnt off," involves an experience which some of our children could not have had. So we see how possibilities of in-school learning are conditioned by pre-school environment. The question of the relative influences of environmental

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experience and maturation on child learning in science is important.

Effects

These children speak of two effects of heat, Evaporation and Conduction. We are not absolutely certain from these data that, in one case, phenomena of Melting are not implied—"The sun made the snow man disappear."

The frequency is greater for Evaporation than for Conduction [and] more complex. For these data, this is the closest correlation of frequency and complexity.

Note that the word "Disappear" is used in place of "Evaporate." Is this usage significant? Significance may lie in the process of concept formation. When teaching Evaporation should phenomena of disappearance be presented before evaporation is presented as a special case of disappearance?

"The snow man disappeared and went right into the air even while the wind blew. But the wind did not blow the snow man over." This is an instructive pair of sentences. The beginning of the first sentence indicates that phenomena of evaporation are implied. The conclusion, however, presents ambiguity ("even while the wind blew"). Does the child mean that, because of a cooling effect, the wind should have prevented the snow man from "going right into the air?" The second sentence could support this interpretation. The child could be adding a thought such as this: but, after all, the wind was not so strong (cooling) and, so, the snow man could have disappeared (evaporated). The two statements of this child emphasize the value of interrogation.[1] A few exploratory questions could have given this child opportunity for much clarification of a causal nature.

The statement relative to fog and rain contains causal implications. The child says, in effect, that the sun causes fair weather. With this exception, the conversational intercourse of these children evidences no causal explanations. Their remarks are factual and descriptive. It can be concluded, of course, that with other procedures explanations could have been obtained.

Note the similarity of "You can tell if it is warm by feeling a piece of glass" to "You can make heat by putting your hand on the table and the table will get hot." In both cases explanation, if given, would involve concepts of conduction. Had these children been questioned closely, to what accuracy and complexity would their explanations have ascended? Would the children have explained the glass and the table in the same way?

Thermometer

These children know the results of the action of heat and cold on a thermometer. They do not explain the action.

Two statements bear upon a question discussed for phenomena of Disappearance and Evaporation —the question of development of concepts from generic to specific. The child says, "Cold makes it go down" and "Air makes the thermometer get bigger." Heat is not differentiated from a larger complex, Air. We need careful studies of modes and stages in children's progressively differentiated interpretation of the world.[2]

COMPOSITE DISCOURSE (RECONSTRUCTED)

The children's statements are now given in consecutive discourse, as if one child relates the thoughts of the entire class. In several places, continuity is maintained by additions and shifts of wording. However, the style of the children is preserved. Teachers and students of child psychology may discover, in these products of thought, leads to investigations of processes of thought.

You can make heat in six ways. You can make heat from fires, rubbing, a transformer, a plug, a magnifying glass and yourself.

If you want heat from fires you can use sticks or oil. If you use oil the fire will get so hot that, sometimes, sparks will leave.

If you want heat from rubbing, you can use two stones. Or, you can sandpaper wood. Sometimes, play trains rub on the track so hard that the track gets hot. Even a sled rubs on the snow so hard that sparks come from the sled and you have to rub snow on to cool it.

Transformers and plugs give heat. The transformer on my play train got so hot that the wires burnt off. When I stuck a hairpin in a plug it got so hot that it gave out sparks.

You can make heat with a magnifying glass. Scouts do this. Scouts take a magnifying glass and make fire on paper.

Here is another way to make heat. You can put your hand on a table and the table will get hot. You can tell if something is warm this way, too. You can tell if a piece of glass is warm by feeling it.

Heat will do things. Heat makes things disappear and it makes good weather.

I saw the sun make a snow man disappear. The snow man went right into the air. When the snow man disappeared the wind was blowing but the snow man disappeared anyway. Yet the wind was not blowing very hard for the wind did not blow the snow man over.

The sun helps us to have good weather. We would have fog and rain all of the time without the sun.

Heat makes a thermometer work. Heat hits the little silver thing and it goes up. The little silver thing is mercury and it stretches in the heat. When the air is cold the thermometer will go down and when the air is warm the thermometer gets bigger.

[1]Piaget, J. *The Child's Conception of Physical Casualty.*
[2]Heidbreder, E. F. Attainment of Concepts. *Journal of General Psychology,* 35: 173-223, October, 1946.

OCCUPATIONAL ANALYSIS FOR OUR SCHOOLS

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Occupational analysis is an area of modern educational administration that has long been neglected. In past years considerable emphasis has been placed upon personnel evaluation and aptitude testing, but occupational analysis, which encompasses some of the most objective factors in the educational profession, has not been given serious attention.

As the term is used here, occupational analysis for the educator has only one area of application: the isolation and description of all the implications of a teacher's or administrator's job activities. Such an analysis objectifies the results of successful occupational performance, and at the same time defines the aspects of a job which, if not fulfilled to a minimum degree of satisfaction, will result in personnel turnover.

Occupational analysis should not be confused with efficiency rating, aptitude testing, time and motion studies, or any other kind of personal evaluation. It is concerned only in objectifying pertinent factors that define a job; the individual who does that job is not considered in the completed analysis even though he has contributed to the creating of his professional position. In other words, it is the job which is analyzed, not the individual who performs it.

The reaction of many educators to the proposal that occupational analysis can be utilized in the professions is negative. They doubt the feasibility of the use of objective analysis techniques to describe and define an educator's job. Most educators will admit that job analysis has some value in industry where occupations are repetitive, and also that personnel departments in industry find analyses valuable in selecting and training workers. They argue, however, that such techniques will never work in the educational profession. Their reasons may be generalized as follows:

1. The duties of the educator are tied in with a vast area of intangibles that cannot be objectified. How can such factors as personality, ambition, prudence, judgment and sensitivity to situations be described in objective analyses?

2. The educator's job includes the use of social and psychological skills and facts which are not necessarily repetitive or manipulative. These skills cannot be stated in an analysis without writing volumes.

3. The educator's job is constantly changing as a result of the interaction between himself and the dynamic conditions of his job environment. Even if a satisfactory analysis could be made, it would soon be obsolete and would tend to enforce a rigidity upon teachers and administrators that would limit and discourage initiative.

These opponents of occupational analysis for our schools have on the whole based their arguments on analysis techniques used in industry. *Yet the objections to job analysis in the field of education, as above stated, are valid only to the extent that they are not solved.* Any authentic analysis system must answer these objections successfully as a prerequisite to a valid analysis of any professional job.

Speaking both as a professional business consultant and analyst, as well as an educator with years of practical teaching experience on most levels, the author believes that the objections to educational job analysis can be proven incorrect to a major degree. In addition to industrial clientele, the author has participated in making job analyses for schools in Oregon, California and New York. As a result of these experiences, many important advantages of occupational analyses for schools have become evident:

1. When a school board hires a teacher or administrator the board members have in mind, consciously or subconsciously, certain qualifications which must be met. In determining the salary, however, many of these are not considered. For example, in varying degrees throughout the United States, school districts demand conformance to local religious and social mores. Often this emphasis even exceeds professional standards in local importance. Some communities fail to renew a teacher's contract because he or she attends public dances, spends too many week-ends out of town, partakes of an occasional cocktail, or neglects to participate in certain religious or community activities. Recently one teacher was discharged from a school district in Oregon for showing partiality to a political party with which the voters of the community were not in sympathy. Another, in New England, failed to have her contract renewed because her makeup and wardrobe did not conform to local standards.

Whether or not we approve of these extra-professional qualifications is not so importat as the recognition that lack of conformity to local precedents and mores contributes largely to the present high rate of teacher turnover in the United States. When this is the case, it should be made clear that conformance to community mores is a part of the considerations which go to make up an occupational analysis. If prospective teachers and administrators were to have an opportunity

to look over various job descriptions in which these required sociological factors were clearly stated, then one of two things would likely result:

(a) A greater selectivity would take place. Educators who could best adapt themselves to a community's qualifications would probably apply for and receive the professional positions available; morale would be increased and teacher turnover reduced.

(b) The community would fail to attract enough educators willing to conform to local standards, and would therefore be more inclined to modify its demands on the personal after-school life of the educator. In either case, the result would be advantageous both to the teachers and to the school system.

2. All schools have areas of pedagogy and administration which are molded in varying degrees to fit specific historical precedents and philosophies of education. After the teacher has accepted a position, the analysis technique must permit the job to be redefined by the interaction of the new teacher with the flexible considerations of his position. This adaptability will not only assist the fulfillment of personal aptitudes and drives, but will also reveal those areas in the school system where change is resisted or permitted only gradually. The analysis will act, at times, as a restrainer from imprudent action on the part of an educator; at other times it will be a spur to creative activity. Strategy for social change would thus have a more objective base.

3. Job analyses tend to define areas of administrative responsibility and authority more objectively, and thus duties are clearly defined. Lines of authority can be established, as of the superintendent, for example, compared with the school board. This comparison helps to eliminate many of the administrative misunderstandings which characterize many school systems today. There is no reason to believe that administrative responsibility or authority cannot be stated objectively. They certainly have objective and measurable results when their jurisdictions are not clearly defined.

4. Objective occupational analysis provides a means of dealing more adequately with staff personnel problems. When misunderstandings arise as to job content or when changes in responsibilities take place, a constant revisal and adjustment of the analysis can be made to encompass the dynamics of the situation. For example, inequities of work load distribution developing between members of the teaching staff can be located, and such factors as time spent doing necessary homework, extra-curricular activities, community service, as well as classroom duties can be measured, and equitable adjustments made.

5. A comprehensive program of job analysis in the teaching profession can provide teacher- training institutions and placement services as well as prospective educators with a realistic picture of the occupational problems in the field. In this way, a closer correlation of theory and practice in the educational profession may be achieved. When the actual needs of the community are designated, appropriate steps can be taken to prepare educators to work and live successfully on the functioning level of American democracy.

6. A complete analysis of the educational efforts of a school system provides the basis for evaluating the existing integration between the needs of the community and the results of educational experience. Occupational analyses can also help to achieve greater integration between the specific educational activities within a school system, thus eliminating duplication between areas and providing students with a more realistic understanding of their society.

In order to achieve more satisfactory results from occupational analysis, the following suggestions are offered.

Focus — Any kind of valid occupational analysis must always analyze the position, not evaluate the individual.

Format — The format of an analysis should always be readily comprehensible to all concerned. The objective should be simplicity without loss of validity. The most practical format for occupational analysis is the one page two-dimensional chart. This chart should utilize adjustable Descriptive Factors under which respective Items describe occupational details in reference to specific Blocks defining respective occupational implications. (See figure 1.)

SAMPLE
Occupational Analysis Format
By Use Of
Two Dimensional Outline
Techniques

Descriptive Factors

Blocks of Work	Materials Equipment	Time Spent	Regulations	And Others
Teaching Activities	Items			
Making Reports		Items		
Conducting Extra-Curricula Activities			Items	
Engaging in Community Living				Items
And Others				

(Fig. 1)

Adaptable Descriptive Factors — The Factors, samples of which are suggested in Figure 1, are descriptive points of reference used to facilitate chart analyses, and they must be selected with the mutual consent of all persons concerned. The attempted use of Standardized Factors for all educational institutions must strictly be avoided! Such standardizations would prevent the flexibility of analysis which is needed to describe the unique and varying conditions found in different educational institutions and which is provided by "The Adaptable Factor Technique." It is important to note, however, that when Factors have been selected they must be standardized for the whole school system, in order to provide a uniform set of descriptive references defining the "circumference" of all positions to be analyzed. Some examples of Factors applicable to schools are:

1. Materials and equipment used
2. Personal requirements demanded by the community
3. Time spent
4. Mental demands
5. Physical demands
6. Working conditions
7. Student load
8. Personal expense (not reimbursed)
9. Institutional regulations
10. Areas for innovation
11. Hazards (above the average)
12. Experience
13. Professional preparation required
14. Responsibility
15. Authority
16. And others

When the Descriptive Factors have been selected, they should be set horozontally across the top of the chart over vertical columns for Defining Items. (See figure 1.)

Blocks — All occupational activity, regardless of the job, can be broken down into coherent families of closely related elements, designated in the left-hand vertical column of figure 1 as Blocks. The lines enclosing each Block are drawn horizontally across the vertical columns under the Factors, and in the resulting squares are listed the Items or phrases which describe each Factor's degree of application to the various occupational Blocks. In instances where the Factors do not apply to a particular Block of work the space is left blank. This variance of Factor application to Blocks of work has graphic as well as literal significance.

Some of the Blocks of activities that are applicable to many educational positions are:

1. Teaching activities
2. Extra-curricula activities
3. Filling out forms
4. Counseling
5. Attending faculty meetings
6. Engaging in community living
   (a) freedoms (b) mores (c) obligations
7. Traveling
   (a) on the job (b) cultural and professional
8. Relations with parents
9. Engaging in community lectures and public service
10. Professional improvement
11. And others

Items — The Items stated in the suggested format should describe the important phases of a job in short descriptive phrases, as abbreviated as possible without sacrifice of meaning. (See figure 1.) When the analysis is finished these Items in relationship to Blocks and Factors produce a format so cross-indexed as to make all aspects of an occupation readily available on one chart, although if described in essay fashion fifty or more pages might be needed.

Conference Procedure — One of the essential activities of occupational analysis is the conference, which must include all interested persons. After the Factors have been selected for the school and the Blocks of work designated by the educator whose job is being analyzed, recall of pertinent information is greatly facilitated by the following techniques:

(a) By a procedure akin to psychoanalysis, each occupational activity related to the respective Blocks is analyzed. Each descriptive Factor becomes the leading question. This method greatly reduces unnecessary waste of conference time.

(b) Another technique is utilization of the Master Analysis. Master Analyses are composites of all similar jobs analyzed in the past. Review of the items on the master sheet facilitates by association the recall of pertinent material.

Reliability and Validity — The reliability of any analysis procedure should be established. One method is to have two analysts using identical techniques analyze a job and compare their results. The validity of the technique is established automatically while the analysis is being constructed. The interested parties (other than the person whose job is being analyzed) become the criteria, as they constantly check the accuracy of information listed in the occupational description. It is impossible to achieve validity when a job analysis procedure is confused with personnel analysis or with any kind of proficiency evaluation, which are distinctive and separate activities.

Occupational Evaluation — Occupational evaluation is the technique of comparing the importance of one occupational position with another statistically. It is closely related to job analysis because it should be based upon the analysis. However, job evaluation is a definite and distinct procedure whose importance should not be overlooked, although space does not permit of its consideration in this paper. It has been comparatively neglected in all professional areas, and outstandingly ignored in education.

Maintenance — Any system of occupational analysis must be kept current to prevent rigidly and obsolescence. Growth and change in individuals, combined with dynamic occupational conditions, constantly redefine duties and responsibilities. The results of this interaction between the individual and the occupational environment can easily be incorporated in the analysis form by periodic adjustments.

Qualifications of the Analyst — All job analyses should be made by properly trained analysts. Because of psychological reasons, individuals are often more willing to cooperate with an impartial outsider than with their colleagues in matters pertaining to job analysis.

In summarizing, it may be said that there are no indescribable intangibles in any job. Intangibles appear only when the subjective considerations of personnel evaluation are confused with objective job analysis. If any occupation can be learned or performed satisfactorily, it is because there are objective, psychological, sociological and operative Blocks which give it meaning and content. In the suggested analysis technique, this meaning is obtained by use of respective Factor considerations which give circumference to all occupations. Such terms as good personality, ambition, prudence and progress are semantic abstractions which collect many meanings through subjective value judgments, themselves often based upon consideration of the person, not the job. No job has ambition, nor is it prudent, nor does it have personality. It is true that some aspects of occupational duties may find convenient classification under such terms, but in their undefined state these abstractions alone have little value as part of a job analysis.

The activities of an educator do of course utilize both physical and mental skills based on conceptual knowledge and socio-psychological techniques. However, concepts, knowledge and socio-psychological skills which are necessary to an occupation must be communicable. Otherwise, how could they have been learned in the first place? All learned knowledge and all learned skills are the results of objective experience. By definition, objective experience must be describable or it could not have been conceived in the learning process.

In reference to the opponents' arguments that occupational analysis would discourage initiative and thereby retard educational progress, it may be said that initiative and the fire of imagination, which are the components of progress, are extinguished easily by constant frustration. Occupational analyses in a school system can give teaching and administrative personnel a blueprint of their positions as they exist in practice. The analysis can show each person how best to conform to the cultural and administrative configuration of his job environment. The educator can judge where and when innovation will succeed; he can know also in what areas any social change will provoke resistance. When effective utilization of sociological knowledge brings about a social change then, naturally, the respective occupational descriptions should change accordingly.

Through the technique of occupational analysis, many of our molding traditions can be aired in the fresh sunshine of objectivity. Such objectification of occupational conditions and requirements may deter many prospective educators from accepting positions and thus effect a liberalizing of existing standards. The author has discovered from experience that the mere objectifying of an educator's job has a therapeutic effect upon those who determine the conditions of a job. The result could easily be greater emphasis upon more realistic educational objectives. On the other hand, educators may sometimes be motivated to accept jobs under challenging conditions with social change in mind, and from this constructive consequences could result.

All social and material progress must be defined in terms of human needs. In the field of American education today, there is a widefelt need for the increase of morale and efficiency, reduction of personnel turnover, and the elimination of social lag in educational philosophy and methods.

These needs can, to a great extent, be met by reducing the inequities of work-load and salary between teachers and administrators, by proper matching of the educator with his job, by proper demarkation of responsibility and authority, and by eliminating obsolete restrictions on the private lives of educators.

Occupational analysis for our whole school system, from elementary school through college, can go a long way in providing the tools by which these corrections can be made.

STATEMENT OF OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946.

Of MAIN CURRENTS in Modern Thought published Quarterly at Port Chester for October 1st, 1949. State of New York, County of Westchester. Before me, a Notary Public in and for the State and county aforesaid, personally appeared F. L. Kunz, who, having been duly sworn according to law, deposes and says that he is the editor, publisher and owner of the quarterly MAIN CURRENTS in Modern Thought and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily, weekly, semiweekly or triweekly newspaper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the act of August 24, 1912, as amended by the acts of March 3, 1933, and July 2, 1946 (section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, F. L. Kunz, Port Chester, New York; Editor, F. L. Kunz, Port Chester, New York; Managing Editor, None; Business Manager, None. 2. That the owner is (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) F. L. Kunz, Port Chester, New York. 3. That the known bondholders, mortgages, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. (Signed) F. L. Kunz.

Sworn to and subscribed before me this 20th day of November, 1949. Marshall E. Matteson. (My commission expires March 30, 1950).

THE NATURE OF PHYSICAL REALITY

Henry Margenau, Yale University

(McGraw-Hill, New York, 1950, pp. 467, index, $6.50)

A REVIEW

The author of this volume is professor of physics and of natural philosophy at Yale University. He is very generally known through texts which are in nearly every college library, and in wide use in courses of study in advanced physics. Readers familiar with that group of lucid expositions will anticipate the same directness and clarity in the present publication. They will not be disappointed. Yet even for the thousands who know Professor Margenau through the printed page, as a teacher in technical fields where advanced mathematics is the required medium of expression, a new experience is at hand. For here Margenau has undertaken the examination of a subject much more baffling than Relativity, and he has elected to deny himself the aid of equations.

The result is a triumph, a work which will open up the frontier of contemporary physics in a new way to many thousands of readers to whom that important area is closed off by what is to them an impenetrable jungle of mathematics.

The Nature of Physical Reality is concerned with thermodynamics, electromagnetics, and the other major blocks of systematized physical science, in terms of mutual relations between blocks as wholes, and in terms of ultimate significance: What do mind and the rules and structure of matter have in common? To get at this the book reviews the essential philosophical content of each chief conceptual group of topics. This is the first gift to the reader. He may be quite confident that nothing has been ignored because it is obdurate or obscure. Professor Margenau is not concerned primarily to display his own consistency or competence. These appear, and all the more clearly, because they manifest indirectly out of a concern about the essentials to insight locked up in the wholes of the physical universe, as man sees it.

The second benefit to the reader is that the author is not concerned to write down to anyone. The effect of this is to pull the reader up to a new level. There are hundreds of useful books on physics by writers who want only to describe its works. From these the reader gains an understanding which is often fictitious because it rests upon the factitious. There are dozens of provocative books on the philosophy of science, in which the compass of philosophical orientations is boxed, the winds of data coming in by gusts from all quarters. The writer of one of these works stands staunchly at the helm, undisturbed; and quite naturally, for he selects his own breezes. But the reader, at the end, may be a bit dizzy from taking sights now from Kant, then from Hegel, next from John Dewey or Sartre. Margenau is concerned with the subject matter in its massive entirety, not in its boring minutiae. The reader is brought squarely before the resources of physical science, and is then stocked up with the data he needs to grapple directly with the problem, not with persons, however celebrated. Insofar as the mind is part of reality — and that part is now conceded to be very large indeed — great minds appear here as champions, not as distractions.

In consistence with all of this faithfulness to the reader's needs, and quiet conviction as to the competence of his policy, the author keeps directly at the major topic, and most mystifying of all recent accomplishments of physics, namely, quanta. There is a precedent which allows us to believe that it is his success with that topic which will ensure for the author of this book an immediate new public, and continuing usefulness for this volume.

Eddington achieved a surprising response among non-scientific readers with *The Nature of the Physical World*. In retrospect, the reason for this is plain. The structural order of habitual thought among scientists had been cracked throughout its whole extent by the solid thrust of Relativity, constituting a profound shift at the very center. This deep disturbance was sending out waves in all directions, only dimly felt by the general public. Eddington's book might normally have been read by a few thousand teachers and philosophers out of desperation, and then faded from sight. But the jolt of Einstein's tremblor had prepared the whole world. At one stroke Eddington tumbled down the old structure of classical, mostly mechanical, physics for the general reader. The news spread, and thus was won an unprecedentedly large public for a book which was — and remained so, after it had been read — as esoteric as Ezekiel to many thousands of us.

In the late Twenties and early Thirties of our Century of the Common Psychosis, a second shift was made close in at the very heart of physics. The effect was even more disturbing than Einstein's accomplishment with the special and general theories of Relativity in 1905 and 1915. Werner Heisenberg and Ernst Schrödinger, in particular, confronted the comparatively tidy atom shaped up by Niels Bohr, and put what seemed impertinent questions to that neat little series of solar systems, the chief being addressed to the electron in two parts: "Where are you right now? How fast are you going?" When presently it became clear that both of these two questions could be answered together only statistically, a series of premature conclusions was drawn, mostly by physicists who were not schooled philosophers, or philosophers who were not atomic physicists. The believers in statistics were jubilant, with a

quiet seemliness, having told us so. The faithful remnants of neo-Darwinian believers in chancy randomness seized upon the principle of indeterminacy as final proof that the universe is a kind of colossal game of Canasta.

Margenau returns the responsibility for reading randomness and hence disorder into all nature to the place where it belongs, namely, the relation of the senses to the external world. He makes it quite clear that the orders of the human mind provide science with its exactness, and give it its crucial usefulness, predictive certainty.

Kant was compelled to leave the cognitive problem unsolved, not presumably for lack of genius, but only because the information needed to solve it was not at hand. Nevertheless he rightly restored the human mind to the center of the system by revealing its role of judgment between two entities given: the conceptual or transcendental element which enables us to reflect on Nature as wholes, and the practical or objective applications of reason which bring the external world to judgment along sensory paths, in parts. The world of physics in the 18th century afforded no rational means of converting the two worlds into one. Hence Kant, with all his ability, could only take a stand upon the true nature of the mind as a protestant against dogmatism and irrational mysticism.

Our outlook has now utterly changed. The field and not the phenomenon has risen to a place of supremacy in physics. Our contact with the phenomenal world is channelled and uncertain. Margenau makes clear how all of that is approximate. But science no longer gets its real (that is, ultimate, and causal) significance from that end, because the behavior of matter and energy is not alone *judged* by mind. It is *determined* in an important sense by the properties of the field. There is thus a new task for us, to examine the veil of energy to see whether or not it is a vesture which both conceals and reveals an anatomy of the universe which has a workable identity with the anatomy of the mind. We are also no longer limited by the suspicion that the identity is subject to no independent tests. Gestalt psychology provides instruments to examine the mind independently of changing data; parapsychology indicates its relations with some kind of field.

It is Margenau's great contribution to our times that he wants to tackle the problem by marshalling the evidence, not by erecting complex reasoning processes upon selected data. He follows his own prescription, in this book. His confidence in the reader's deep need to know, and his own obvious familiarity with his materials and chosen method, enable him to array the evidence for a deep-lying structure. The reader is shown that his own true nature, as a reasonable, conceptualizing human being, is one with specific properties of the space-time-energy field.

This constitutes the revolution. The soft and treacherous meanings which have been branded upon the words *ideal* or *transcendental,* in recent generations, are now being erased. Man as man, and nature as field, are being equated. The series of dualisms, dichotomies, the "either-ors," the pointed polarities, extremisms, Fascism-Communism, schizophrenics of the last several decades are running out. The nature of physical reality is to be understood as a unity of mind and universe not at a naive level of simple materiality, subject to description, but in a deep-lying level which the theory of quanta compels us to attend to, despite our tendency to resist because we have confused habit of thought with real intuition.

It would be unfair to reader and author to suggest that all of the chief links of knowledge get equal treatment here in one volume. The stubborn insistence of life upon sentience and beauty, purpose and continuity, in the cosmic system, is evident to all, physicists included. Professor Margenau pauses more than once to take note of this challenge. One concludes from his words that he sees no occasion to doubt our ability to tackle this problem on the new ground without succumbing to reductionism, a subordination of biology to physics and chemistry. He is perhaps not as clear on this point as one might like. More extended discussion of this basic issue would be helpful in the second edition of this work, when perhaps new studies by biologists may make that possible in terms of the rigor which are here employed for energy and matter.

The Nature of Physical Reality was in process when its author became the Chairman of the Board for the FOUNDATION FOR INTEGRATED EDUCATION. Because of his deep-rooted interest in the known role of concepts in exact science, here made so clear, Professor Margenau has described for the Foundation a primary project in integrative study consisting essentially in examining the concepts of every department of learning, so that these fundamentals can be studied by all, not alone used by the expert. We may take it, therefore, that this volume under present review is the first of what should be a series of publications restoring slowly but with implacable forward motion, a sense of unity, a knowledge of the structure of reality, to learning.

If Professor Margenau and his colleagues can press forward with this program, the world will have occasion to remember them with gratitude, and *The Nature of Physical Reality* may be looked upon as the beginnings of a profound shift effected in educational philosophy, leading to peace of mind and eventually therefore to peace on earth for that dwindling species, men of good-will. Meantime here is the beginning; and the author will be on hand as co-chairman with F. S. C. Northrop, at the Stillwater Conference, to help open up this grand avenue to the new vistas. F. L. KUNZ

MEASURE without Measure

A group at the University of Chicago have founded a new quarterly magazine, *Measure, A Critical Journal.* Vol. I, No. 1, Winter, 1950, is before us. The Board of Editors is announced: Daniel J. Boorstin; David Grene; Robert M. Hutchins, *Chairman;* John U. Nef; Robert Redfield; Henry Regnery; Otto G. von Simson, *Managing Editor.* (Subscription $3.50 a year, the Henry Regnery Company, 20 West Jackson Blvd., Chicago 4).

The leading article, by Chancellor Hutchins, takes the measure of T. S. Eliot, in the form of a criticism of *Notes Towards a Definition of Culture,* in which Mr. Eliot appears to deplore the stating of the purpose of education, and writes of education with that confusion which can appear in the prose of poets entitled — nay, expected — to puzzle over paradoxes. Dr. Hutchins may therefore be said to have made mincemeat out of what began as hash. This occupies seven and a half of the eight pages, and is perhaps worthwhile. For it is always a delight to observe Mr. Hutchins squaring away to demolish someone, and on this occasion he rewards us at the end additionally with this admirable bit of reference to definition, purpose, and method in higher education.

> "We can learn from metaphysics that man has intellectual and moral powers. Education should make its contribution to the development of those powers. We can learn from theology that man has a spiritual nature. Education should do what it can to perfect that nature. We can learn from politics that democracy is the best form of government, a conclusion reinforced by metaphysics, which leads to the rights of man, and by theology, which teaches that all men are brothers because they are all sons of God. Education should help all men to prepare themselves for their task of democratic ruling. The aim of education, as distinguished from training, adaptation, or instruction, is the improvement of all men as rational, moral, spiritual, and political beings. [Here occurs this footnote, which we incorporate in the text: This paper does not purport to answer the question how and to what extent education can contribute to the improvement of men as rational, moral, spiritual and political beings. That is the educational question, which can be satisfactorily answered only when we get our metaphysics, ethics, psychology, theology, and politics straight enough to think straight about it.]
>
> "The purposes of education [Hutchins concludes] do not originate in the educational system. Still less are they determined by the prejudices of educators or of writers on education. They are fixed by the nature of man."

Some of us are admirers of the goals Chancellor Hutchins aims to achieve, and of his tenacity of purpose, in getting on to them. Skills in method are apparent in the University of Chicago products as we meet them. Freedom and free discussion are the very air of that campus. But we constantly marvel at the apparent obtuseness to the opportunity science now offers us to get our metaphysics and theology straight. This sense of wonder now increases. For here is a new magazine of worth and promise. It is called *Measure.* Its first issue contains a truly penetrating article (by C. F. von Weizsacker) on *The Experiment: Its Nature and Its Limits,* which we shall hope to be permitted to reprint for our readers at an early date. Yet the role of measure in doing the job that wants doing — the honest accommodation of science into its place among the cultural moods — seems to have little place in the Chicago program. It would be heartening to see all the power and ability displayed on the Midway applied to the field where a consensus can really be worked out with compelling effect. F. L. K.

TEACHING IN DUTCH UNIVERSITIES

William Ernest Hocking*

I was impressed by the light load of hours of lecturing carried by the Dutch professors as compared with their American colleagues — 2 or 3 hours per week in one case, 5 to 15 or more in the other. In addition to numerous lectures, the American professor usually gives an examination to all students at the end of each course, and also various "hour-exams," with assigned essays or reports on reading, all of which have to be carefully examined and graded. Students in Leiden are not examined en masse at all; and there are no regular examinations at the close of a course of lectures. Examinations are individual, and relate to the attainment of the several stages of academic certification.

Years ago, Professor Levy-Bruhl spent some time at Harvard University. On one occasion he remarked to me on the number of hours of lecturing done by the American college teacher. "In America," he said, "you respect scholarship, but you do not respect the conditions of scholarship. At home in Paris I give two lectures per week; the rest of my time is for my own study and writing." In Europe, generally, the assumption is that the lec-

*Alford, Professor of Natural Religion, Moral Philosophy, and Civil Polity, Emeritus, Harvard University. Professor Hocking recently spent a year as visiting professor at the University of Leiden. The address from which the statement is quoted was entitled, "Impressions of Leiden and of Dutch Higher Education." It was delivered to the Netherland-America University League in New York City. This extract appeared in *Higher Education,* Jan. 15, 1950.

ture is not the Professor's main work, but the *fruit of it.* His service to the university and to the world is his effort at the frontier of knowledge, recorded chiefly in writing, reported from time to time in lectures.

The American situation results in part from the immense educational undertaking of which we have spoken, in part from the system of bookkeeping necessary to give an honest value to diplomas delivered in thousands, in part from immaturity of purpose in the American college boy. Unless the student has his own mental initiative, and therefore his own questions, the labor of the instructor is first to raise the appropriate question in his mind and then supply the answer. One lecture a week is not sufficient for this process; the student's mind must be stirred thrice. He will not find his own way to the relevant books; he must be supplied with bibliography, estimates and directions, and then quizzed from time to time to see that the reading is done and perhaps understood. Thus the energy of the professor, in his role of teacher, is in danger of being absorbed by police work and record work; as he advances in his profession, the institution comes to his rescue by supplying assistants, who must in turn be supervised and coordinated. Thus the cost of higher education in America is increased per capita by this large auxiliary staff, which — since it cannot be at the level of competence of the instructor — must operate according to fixed rules in the assignment of unit credits, and the spirit of learning runs out into a mechanism with commercial overtones.

I am not objecting to drudgery: there is no profession without drudgery, and the more responsible the profession, the greater the amount of drudgery willingly assumed for great ends. The Leiden professor has his arduous duty to society in the careful individual examination of candidates, a time-consuming and ethically trying process. It is to the honor of the American college that the task of teaching is taken with such painstaking seriousness. But the question has to be raised whether this elaborate process attains its end.

The end is mental power. And power cannot be tested by the ability of any student to answer *my* questions. It must be tested by the ability of the student to frame his own questions, and devise his own way to an answer. I submit that the American method by its very laboriousness for the teaching staff is in grave danger of defeating its own end, the development of power in the student.

I was first impressed and then somewhat appalled by the extreme politeness of the Dutch student. He was in his seat before I entered the lecture room: that was as it should be. But he insisted that I should leave the room before he stirred from his seat: and this troubled me, because one of the pleasures attending lecturing in America is the gathering of students around the desk, after the close, for informal discussion. In Holland this was out of order: and neither could I induce my student-hearers to interrupt the lecture with questions, or with signs that I was not being understood. I remain amazed at the capacity of Dutch students to follow lectures in English: I know of no other European country in which this is true to such a high degree. But I am sure there were difficulties, and I hoped for liberal interruptions: but the students were too courteous!

It therefore became an early problem, how to secure some give-and-take between student and teacher. There were of course the office hours, and many a pleasant memory attaches to the beautiful room on the Rapenburg which the university put at my disposal. But the real answer I found in the unique Dutch institution of the "dispuut."

The dispuut faintly resembles what we call a "seminar"; but there is this radical difference. The seminar is the professor's enterprise; the dispuut is the student's enterprise. The membership is determined by the students, the officers are chosen by them; they create their own program — with consultation of the professor in whose course the dispuut is formed; they write their own essays. The professor is allowed to be present at their gatherings, and he is requested to comment on the papers read — not at too great length; and the students join in the discussion. Tea and cakes are likely to be served as a break in the 2- or 3-hour evening sessions. Here is the real meeting of minds. And here is the real development of power; for here you see the natural evolution of the student's own process of inquiry, and the professor is relegated to his normally secondary and auxiliary role.

In the dispuut, *Ti to dikaion,* "What is Justice?", formed in connection with my college [course] on philosophy of law, the essays were written in English, and discussed in English by the students, in careful consideration of my incapacity in Dutch. My dear friend and colleague, Professor Langemeier, was always at my side to aid in explanations. The memories of those evenings together are very precious. The work of deciding on dates for meetings, and the places, and the number of papers we could consider in an evening — always overestimated — brought me into close association with the student officers; I gained great respect for the care and dignity and perfection with which they did their parts. I shall never forget them, nor the edifice they built, and which we enjoyed together, the dispuut *Ti to dikaion.*

I am convinced that this idea could with profit be spread to other lands, especially to our own; though whether the union of skill, maturity of purpose, persistence under difficulty, organizing capacity, and friendliness exist in the right proportion elsewhere than in Holland is to me a matter of doubt.